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March 30, 2015

Mr. Erich Weissbart, P.G.
U.S. Environmental Protection Agency, Region 3
Environmental Science Center
701 Mapes Road
Fort Meade, MD 20755-5350

Subject: Union Carbide Corporation Technology Park, 2014 Groundwater Monitoring Report

Dear Mr. Weissbart,

On behalf of Union Carbide Corporation (UCC), CH2M HILL is pleased to submit the 2014 Groundwater Monitoring Report for the UCC Technology Park in South Charleston, West Virginia. The potential cause(s) for the increasing trends discussed in the report are currently being evaluated. After the evaluation is completed, the proposed path forward will be presented to the U.S. Environmental Protection Agency and the West Virginia Department of Environmental Protection.

If you have any questions or comments please contact Jerome Cibrik at 304-747-7788.

Sincerely,

Dawit Tecle
CH2M HILL
Project Manager

EN0330151034IDA

cc: Jerome Cibrik/UCC
Charles Armstead/WVDEP
Tracy A. Jeffries/WVDEP
Philadelphia, PA USEPA File Room

Report

2014 Groundwater Monitoring Report

Union Carbide Corporation
Technology Park
South Charleston, West Virginia

Prepared for

Union Carbide Corporation

March 2015

CH2MHILL®

Contents

Appendixes

Acronyms and Abbreviations

CCR	*Current Conditions Report*
facility	Union Carbide Corporation Technology Park, South Charleston, West Virginia
GWMP	groundwater monitoring plan
GWMR	groundwater monitoring report
MCL	maximum contaminant level
PCE	tetrachloroethylene
UCC	Union Carbide Corporation
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WVDEP	West Virginia Department of Environmental Protection

SECTION 1

Introduction

This groundwater monitoring report (GWMR) has been prepared for the Union Carbide Corporation (UCC) Technology Park (hereafter referred to as the facility) in South Charleston, West Virginia (Figure 1-1). This GWMR presents the data and findings for groundwater sampling conducted in 2014.

The U.S. Environmental Protection Agency (USEPA) issued its final decision for the facility on December 17, 2010 (USEPA 2010), and the West Virginia Department of Environmental Protection (WVDEP) incorporated the final decision into a revised Resource Conservation and Recovery Act permit for the facility on February 2, 2012 (WVDEP 2012). Long-term groundwater monitoring in accordance with the agency-approved groundwater monitoring plan (GWMP) (CH2M HILL 2009) is a component of the final decision for the facility.

Groundwater monitoring at the facility was conducted in accordance with the GWMP to meet the following objectives:

- Monitor water levels to evaluate potential changes in groundwater flow directions;
- Monitor constituent concentrations to evaluate trends;
- Monitor constituent concentrations to evaluate conditions in the Ward Hollow groundwater plume;
- Monitor constituent concentrations to evaluate groundwater conditions in the Greenhouse Area;
- Evaluate the integrity of the monitoring wells being used in this GWMR by conducting inspections; and
- Monitor the effectiveness of corrective measures.

Additional groundwater sampling, beyond that which is required in the GWMP, was conducted for Ward Hollow in 2014 to further evaluate observed increases in groundwater concentrations in the Ward Hollow monitoring wells.

SECTION 2

Background

The facility covers 574 acres in the city of South Charleston, West Virginia, including 267 acres that have been sold or donated to other parties. UCC has retained the remaining 307 acres, which consist largely of the landfills and areas surrounding the landfills. Topography at the facility is generally steep, with flatter areas at the top of hills that are developed. Other portions of the facility terrain have been altered by the construction of the Lower Ward Landfill, Ward A Landfill, and Ward B Landfill (Figure 1-1). The elevation of the facility ranges from 580 to 1,090 feet above mean sea level.

The areas of groundwater contamination addressed in this GWMR are Ward Hollow and the Greenhouse Area, both of which are discussed in detail in the *Current Conditions Report* (CCR; CH2M HILL 2008) and summarized below.

2.1 Ward Hollow

The Lower Ward Landfill, Ward A Landfill, Ward B Landfill, and the former brine wells have contaminated groundwater in Ward Hollow. Contaminated groundwater has migrated from these sources to the underlying weathered bedrock and then downgradient into Ward Hollow. The most prominent constituents present within this plume are 1,4-dioxane, benzene, bis(2-chloroisopropyl)ether, arsenic, and barium. Evaluations of the plume prior to the final decision concluded that it was stable; however, groundwater monitoring implemented after the final decision indicates increasing concentrations of bis(2-chloroisopropyl)ether and benzene for some wells in Ward Hollow.

2.2 Greenhouse Area

The source of groundwater contamination in the Greenhouse Area is unknown. Two monitoring wells (WVU-MW04 and MW-104A) screened in the Mahoning Sandstone have exhibited detectable concentrations of volatile organic compounds (VOCs).

SECTION 3

Groundwater Monitoring

Groundwater samples and water levels are collected every 9 months at the locations shown on Figure 3-1 in accordance with the GWMP (CH2M HILL 2009). For 2014, groundwater samples and water levels were collected in September 2014 in accordance with the GWMP. Additional groundwater sampling and water level measurements were collected at Ward Hollow in March, June, and December 2014. This section summarizes how the sampling was conducted and observations made during sampling activities.

3.1 Water Level Measurements

Table 3-1 lists water levels and groundwater elevations measured in March, June, September, and December 2014. During each event, measurements were collected over a 12-hour period using a handheld water level meter. Groundwater elevation data from the monitoring wells and piezometers were used to analyze the potentiometric surface and groundwater flow patterns. Water levels were collected from all proposed monitoring wells, piezometers, and staff gauges during each event.

3.2 Groundwater Sampling

Groundwater samples were collected in March, June, September, and December 2014. Table 3-2 lists analytical suites and sample identifiers for the monitoring wells sampled. Sampling was conducted using low-flow sampling protocols (USEPA 2002) or volumetric purging if low-flow was not possible based on historical data for a given monitoring well.

In accordance with the GWMP (CH2M HILL 2009), seven monitoring wells in Ward Hollow and two monitoring wells in the Greenhouse Area were sampled during the September 2014 sampling event. Additional samples were collected in March, June, and December 2014 from select Ward Hollow monitoring wells and the Lower Ward leachate collection system. Monitoring locations for the Ward Hollow groundwater plume consists of downgradient wells, sentinel wells, and impacted wells (Table 3-2). Downgradient wells typically have constituent concentrations that are below screening levels. The sentinel wells are the most downgradient wells that consistently have constituent concentrations above screening levels. Impacted wells are wells at the landfill or immediately downgradient of the landfills.

Samples collected from Ward Hollow were analyzed for VOCs, semivolatile organic compounds, and dissolved metals. The two monitoring wells sampled in the Greenhouse Area (WVU-MW04 and MW-104A) historically have contained concentrations of VOCs above screening levels; therefore, the samples from these wells were only analyzed for VOCs.

3.3 Monitoring Well Repairs

Monitoring well inspection conducted during the 2013 and early 2014 sampling events identified the need for sanding/painting the stickup protective casing and bollards for some of the monitoring wells. Sanding and painting of the stickup protective casing and bollards for these wells was completed in 2014.

SECTION 4

Results

4.1 Groundwater Flow Patterns

Groundwater level data, along with the top-of-casing elevations, were used to determine groundwater elevations at the facility and prepare a potentiometric surface map. Table 3-2 presents the water level measurements and calculated elevations for each monitoring well, piezometer and staff gauge. Figures 4-1 and 4-2 show the September 2014 potentiometric surface maps for the Ward Hollow and Greenhouse Area, respectively.

4.1.1 Ward Hollow

Consistent with the topography of Ward Hollow, groundwater flow is to the northwest, toward the Kanawha River. Figure 4-1 shows the potentiometric surface of the Upper Freeport Formation within Ward Hollow for data collected on September 8, 2014. Water levels observed in March, June, and December 2014 were consistent with the groundwater flow patterns observed in September 2014 and previous years; therefore, only the September 2014 results are presented.

4.1.2 Greenhouse Area

Figure 4-2 shows the potentiometric surface of the Mahoning Sandstone within the Greenhouse Area for data collected on September 8, 2014. Groundwater for this area flows to the north, toward the Kanawha River. Water levels observed for the Greenhouse Area in 2014 were consistent with the groundwater flow patterns observed in previous years.

4.2 Constituent Concentration Evaluation

Analytical results for detected constituents in groundwater are presented in Tables 4-1 and 4-2 for Ward Hollow and the Greenhouse Area, respectively. The analytical results were compared to USEPA maximum contaminant levels (MCLs) (USEPA 2009), or if an MCL was not available for a detected constituent, the adjusted USEPA tap water regional screening level (USEPA 2014) was used. These comparisons are provided in Tables 4-1 and 4-2. Appendix A contains the laboratory data packages and the data quality evaluation memorandum. Graphs showing concentrations of select constituents over time for select monitoring wells in Ward Hollow and the Greenhouse Area are provided in Appendix B. Monitoring wells with three or more consecutive non-detect results are not plotted.

4.2.1 Ward Hollow

A comparison of the analytical results to screening levels (Table 4-1) shows that 1,4-dioxane, benzene, bis(2-chloroisopropyl)ether, and barium remain the most prominent constituents present within this plume. Figures 4-3 through 4-6 show the lateral extent of these constituents in Ward Hollow. Analytical data collected in all of the 2014 sampling events for Ward Hollow show that exceedances for benzene and barium remain delineated downgradient by MW-31, MW-32, and BW-02. Similarly, analytical data collected in June,

September, and December 2014 show exceedances for bis(2-chloroisopropyl)ether remain delineated downgradient by MW-31, MW-32, and BW-02. However, 1,4-dioxane was detected at a concentration slightly above the screening level in downgradient monitoring well MW-31. Exceedances of 1,4-dioxane in the downgradient monitoring well MW-31, although infrequent, has been observed previous sampling events and the observed concentrations for 2014 are within historical ranges.

Other constituents that exceeded screening criteria in downgradient monitoring wells were arsenic, naphthalene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and bis(2-ethyhexyl)phthalate. Arsenic only exceeded the screening level in one offsite monitoring well (BW-02). Arsenic historically has been observed in groundwater throughout Ward Hollow. As mentioned in previous reports, the arsenic concentrations in Ward Hollow are most likely representative of naturally occurring levels. Naphthalene exceeded the screening level for the March 2014 sample from MW-32, but was not detected in any of the other downgradient monitoring wells. Bis(2-ethyhexyl)phthalate exceeded the screening level for the September and December 2014 sample from MW-31, but was not detected in any other monitoring wells except MW-23. 2,4- and 2,6-dinitrotoluene exceeded the screening criteria for the December 2014 samples from BW-02 and MW-31 but historically have not been detected in the Ward Hollow monitoring wells so these detections are most likely related to cross contamination.

The results of groundwater samples collected from the additional monitoring wells (MW-20, MW-21, MW-25, MW-27, P-06, and P-11) and the Lower Ward Leachate Collection System are generally consistent with previous detections (Table 4-1).

The groundwater plume stability was evaluated based on monotonic trend analysis of groundwater data using the Mann-Kendall non-parametric statistical test (Gilbert 1987) to investigate whether constituent concentrations in groundwater are increasing, decreasing, or stable. Mann-Kendall statistical tests were performed for four key constituents (1,4-dioxane, bis[2-chloroisopropyl]ether, benzene, and barium) using current and historical groundwater analytical data collected at seven monitoring wells. The trends were stable except for the following:

- Bis(2-chloroisopropyle)ether: three monitoring wells (MW-01, MW-23, and MW-26) exhibited increasing trends.
- Benzene: three monitoring wells (MW-01, MW-26, and MW-28) exhibited increasing trends.
- Barium: five monitoring wells (MW-01, MW-23, MW-26, MW-28, and MW-32) exhibited increasing trends.

4.2.2 Greenhouse Area

The September 2014 analytical data for the Greenhouse Area showed that tetrachloroethylene (PCE) concentrations exceeded the screening level in WVU-MW04 (Figure 4-7). No other VOCs exceeded screening levels in the Greenhouse Area in 2014.

Mann-Kendall statistical tests were performed using current and historical groundwater analytical data collected at the two Greenhouse Area monitoring wells for three key constituents (PCE, trichloroethylene, and chloroform). Monitoring well WVU-MW04 exhibited a decreasing trend for chloroform. All other key constituents for the Greenhouse Area showed stable trends or no trends.

SECTION 5

Summary

Groundwater monitoring for Ward Hollow and the Greenhouse Area in 2014 shows that groundwater flow patterns have remained stable and are consistent with the conceptual site model presented in the CCR (CH2M HILL 2008).

Analytical data collected from 2003 through 2014 for Ward Hollow generally show that bis(2-chloroisopropyl)ether, benzene, and barium have a similar distribution and are delineated downgradient. However, 1,4-dioxane was detected in one of the downgradient wells (MW-31) above its respective screening level and has exhibited a slightly increasing trend since 2012. Exceedances of 1,4-dioxane, although infrequent in MW-31, are within its historical range. Arsenic concentrations exceeded the screening level in MW-23, MW-27, MW-28, and BW-02; however, based on past sampling, arsenic is most likely representative of naturally occurring levels. The groundwater concentration trends based on the Mann-Kendall statistical test for Ward Hollow were either stable or decreasing, except for the following:

- Benzene: increasing trend in three onsite monitoring wells;
- Bis(2-chloroisopropyl)ether: increasing trend in three onsite monitoring wells; and
- Barium: increasing trend in four onsite monitoring wells and one offsite monitoring well.

The analytical data collected in 2014 from the additional monitoring wells, piezometers, and the Lower Ward Leachate Collection System are within historical ranges.

The 2014 analytical data for the Greenhouse Area show exceedances of the screening level for PCE in MW-104A. No other VOCs exceeded screening levels in the Greenhouse Area in 2014.

SECTION 6

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Tables

TABLE 3-1

2014 Groundwater and Surface Water Elevation Data

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Location	Formation	Top of Casing Elevation (ft amsl)	March 2014 Water Level (ft btoc) 3/24/2014	March 2014 Groundwater Elevation (ft amsl) 3/24/2014	June 2014 Water Level (ft btoc) 6/25/2014	June 2014 Groundwater Elevation (ft amsl) 6/25/2014	September 2014 Water Level (ft btoc) 9/8/2014	September 2014 Groundwater Elevation (ft amsl) 9/8/2014	December 2014 Water Level (ft btoc) 12/17/2014	December 2014 Groundwater Elevation (ft amsl) 12/17/2014
Monitoring Wells										
MW-01	Siltstone and Shale above Upper Freeport Sandstone	622.34	1.28	621.06	1.59	620.75	1.25	621.09	1.38	620.96
MW-02	Mahoning Sandstone	775.88	82.24	693.64	82.85	693.03	82.79	693.09	81.86	694.02
MW-04	Conemaugh Red Beds	770.05	8.46	761.59	8.22	761.83	7.90	762.15	7.82	762.23
MW-05	Red and Gray Claystone and Shale	800.71	31.03	769.68	32.94	767.77	33.60	767.11	32.03	768.68
MW-06	Mahoning Sandstone	801.18	57.62	743.56	58.04	743.14	58.28	742.90	57.85	743.33
MW-20	Upper Freeport Sandstone (deep)	608.85	1.22	607.63	1.12	607.73	0.72	608.13	0.79	608.06
MW-21	Upper Freeport Sandstone	608.69	0.50	608.19	0.45	608.24	0.05	608.64	0.12	608.57
MW-22	Siltstone and Shale above Upper Freeport Sandstone	608.73	6.11	602.62	6.16	602.57	5.62	603.11	6.04	602.69
MW-23	Upper Freeport Sandstone	617.65	10.29	607.36	13.70	603.95	14.76	602.89	14.54	603.11
MW-24	Upper Freeport Sandstone	604.07	6.97	597.10	7.29	596.78	6.91	597.16	6.84	597.23
MW-25	Upper Freeport Sandstone	606.70	10.36	596.34	10.68	596.02	10.52	596.18	10.23	596.47
MW-26	Upper Freeport Sandstone	635.37	27.72	607.65	27.92	607.45	27.46	607.91	27.59	607.78
MW-27	Upper Freeport Sandstone	621.09	28.05	593.04	28.87	592.22	30.12	590.97	29.79	591.30
MW-28	Upper Freeport Sandstone	622.45	29.31	593.14	31.19	591.26	30.53	591.92	31.15	591.30
MW-29	Upper Freeport Sandstone	801.50	118.21	683.29	118.24	683.26	118.51	682.99	118.54	682.96
MW-30	Upper Freeport Sandstone	620.19	24.97	595.22	25.97	594.22	26.33	593.86	25.90	594.29
MW-31	Upper Freeport Sandstone	592.06	NM	NA	15.52	576.54	15.54	576.52	15.41	576.65
MW-32	Upper Freeport Sandstone	589.05	18.37	570.68	18.43	570.62	18.52	570.53	18.36	570.69
BW-02	Upper Freeport Sandstone	606.04	29.37	576.67	30.35	575.69	29.99	576.05	29.60	576.44
MW-104A	Mahoning Sandstone	693.21	NM	NA	NM	NA	55.22	637.99	NM	NA
WVU-MW01	Mahoning Sandstone	695.10	NM	NA	NM	NA	24.09	671.01	NM	NA
WVU-MW02	Mahoning Sandstone	693.57	NM	NA	NM	NA	30.65	662.92	NM	NA
WVU-MW03	Mahoning Sandstone	690.88	NM	NA	NM	NA	33.61	657.27	NM	NA
WVU-MW04	Mahoning Sandstone	678.55	NM	NA	NM	NA	15.67	662.88	NM	NA
WVU-MW05	Shale above Mahoning Sandstone	712.22	NM	NA	NM	NA	10.86	701.36	NM	NA
WVU-MW06	Mahoning Sandstone	721.38	NM	NA	NM	NA	1.50	719.88	NM	NA
Piezometers										
P-06	Clay and Siltstone	784.00	6.67	777.33	8.91	775.09	8.03	775.97	8.62	775.38
P-11	Landfill Waste	767.20	6.66	760.54	7.29	759.91	6.08	761.12	6.42	760.78
P-13	Clay and Siltstone	769.90	100.09	669.81	100.00	669.90	100.12	669.78	99.91	669.99
P-14	Claystone	770.70	44.57	726.13	44.70	726.00	44.75	725.95	44.62	726.08

TABLE 3-1

2014 Groundwater and Surface Water Elevation Data

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Location	Formation	Top of Casing Elevation (ft amsl)	March 2014 Water Level (ft btoc) 3/24/2014	March 2014 Groundwater Elevation (ft amsl) 3/24/2014	June 2014 Water Level (ft btoc) 6/25/2014	June 2014 Groundwater Elevation (ft amsl) 6/25/2014	September 2014 Water Level (ft btoc) 9/8/2014	September 2014 Groundwater Elevation (ft amsl) 9/8/2014	December 2014 Water Level (ft btoc) 12/17/2014	December 2014 Groundwater Elevation (ft amsl) 12/17/2014
Staff Gauges										
SG-01 (Next to MW-21)	NA	599.00	-0.10	599.10	-0.20	599.20	-1.00	600.00	-0.425	599.43
SG-02 (Next to MW-31)	NA	584.00	4.60	579.40	4.25	579.75	4.69	579.31	4.475	579.53

Notes:

ft btoc - feet below top of casing.

ft amsl - feet above mean sea level.

NM - not measured

NA - not applicable or not available.

TABLE 3-2
2014 Groundwater Sampling Summary
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

				Analysis		
Monitoring Well	**Well Type**	**Sample ID**	**Date Sampled**	**VOCs**	**SVOCs**	**Dissolved Metals**
MW-01	Impacted	MW01-GW-MMDDYY	4/2/2014, 6/27/2014, 9/12/2014, 12/20/2014	X	X	X
MW-20	Impacted	MW20-GW-MMDDYY	4/2/2014	X	X	X
MW-21	Impacted	MW21-GW-MMDDYY	4/2/2014, 6/27/2014, 9/11/2014, 12/20/2014	X	X	X
MW-23	Sentinel	MW23-GW-MMDDYY	4/1/2014, 6/27/2014, 9/11/2014, 12/19/2014	X	X	X
MW-25	Sentinel	MW25-GW-MMDDYY	3/28/2014	X	X	X
MW-26	Sentinel	MW26-GW-MMDDYY	4/3/2014, 6/30/2014, 9/12/2014, 12/20/2014	X	X	X
MW-27	Sentinel	MW27-GW-MMDDYY	4/1/2014	X	X	X
MW-28	Sentinel	MW28-GW-MMDDYY	3/28/2014, 6/26/2014, 9/10/2014, 12/20/2014	X	X	X
MW-31	Downgradient	MW31-GW-MMDDYY	3/26/2014, 6/5/2014, 9/9/2014, 12/18/2014	X	X	X
MW-32	Downgradient	MW32-GW-MMDDYY	3/26/2014, 6/5/2014, 9/9/2014, 12/18/2014	X	X	X
BW-02	Downgradient	BW02-GW-MMDDYY	3/27/2014, 6/4/2014, 9/9/2014, 12/19/2014	X	X	X
WVU-MW04	Impacted	WVU04-GW-MMDDYY	9/10/2014	X		
MW-104A	Impacted	MW104A-GW-MMDDYY	9/10/2014	X		
P-06	Impacted	P06-GW-MMDDYY	3/25/2014	X	X	X
P-11	Impacted	P11-GW-MMDDYY	3/26/2014	X	X	X

Notes:
VOCs - Volatile Organic Compounds.
SVOCs - Semivolatile Organic Compounds.

TABLE 4-1
2014 Detected Results for Ward Hollow Groundwater
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

Location			BW02				MW01					MW20	MW21				
Sample ID			BW02-GW-032714	BW02-GW-060414	BW02-GW-090914	BW02-GW-121914	MW01-GW-040214	MW01-GW-040214D	MW01-GW-062714	MW01-GW-091214	MW01-GW-122014	MW20-GW-040214	MW21-GW-040214	MW21-GW-062714	MW21-GW-091114	MW21-GW-091114D	MW21-GW-122014
Sample Date			3/27/2014	6/4/2014	9/9/2014	12/19/2014	4/2/2014	4/2/2014	6/27/2014	9/12/2014	12/20/2014	4/2/2014	4/2/2014	6/27/2014	9/11/2014	9/11/2014	12/20/2014
Analyte	**Screening Level**	**Screening Level Source**															
Metals (mg/L)																	
Arsenic, dissolved	0.01	MCL	**0.0307**	**0.036**	**0.0249**	**0.0301**	0.1 U	0.1 U	0.1 U	0.01 U	0.01 U	0.1 U	0.1 U	0.1 U	0.01 U	0.01 U	0.01 U
Barium, dissolved	2	MCL	**0.0554**	**0.0842**	**0.151**	**0.0764**	**56.9**	**55.4**	**55.8**	**56.4**	**61.3**	**51.2**	**55.1**	**54.4**	**53.1**	**52**	**55.9**
Cadmium, dissolved	0.005	MCL	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U	0.01 U	**0.00199**	**0.00219**	0.01 U	0.01 U	0.01 U	**0.00195**	**0.00163**	**0.00186**
Chromium, dissolved	0.1	MCL	0.005 U	0.005 U	**0.0213**	0.005 U	0.05 U	0.05 U	0.05 U	**0.00534**	0.005 U	0.05 U	0.05 U	0.05 U	**0.00656**	**0.0061**	0.005 U
Selenium, dissolved	0.05	MCL	0.001 U	0.001 U	0.001 U	0.001 U	**0.0313**	**0.0255**	**0.0128**	**0.0231**	0.002 U	**0.0232**	**0.0222 K**	**0.0162**	**0.0219**	**0.0195**	0.00625
SVOCs (µg/L)																	
2,4-Dimethylphenol	36	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 U	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 UL	0.538 U	0.562 U	0.588 U	0.538 U
2,4-Dinitrotoluene	0.24	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	**39.6**	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
2,6-Dinitrotoluene	0.048	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	**42.9**	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
2-Chloronaphthalene	75	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
2-Methylnaphthalene	3.6	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 UL	0.556 U	0.581 U	0.543 U	0.526 UL	0.532 UL	0.538 U	0.562 U	0.588 U	0.538 U
2-Nitrophenol	--	--	**5.16 K**	0.617 U	5.88 U	0.549 U	0.526 U	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 UL	0.538 U	0.562 U	0.588 U	0.538 U
3-Methylphenol & 4-Methylphenol	--	--	0.556 U	0.617 U	5.88 U	0.549 U	0.526 U	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
4-Nitrophenol	--	--	**7.09**	2.47 U	23.5 U	2.2 U	2.11 U	2.06 U	2.22 U	2.33 U	2.17 U	2.11 U	R	2.15 U	2.25 U	2.35 U	2.15 U
Acenaphthene	53	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	**0.935 L**	**1.36 K**	**0.812**	**1.37**	**1.19**	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Acenaphthylene	--	--	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Anthracene	180	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Bis (2-chloroethyl) ether	0.014	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	**1.81 L**	**3.11 J**	**1.23**	**1.97 J**	**3.46**	**2.39**	**2.5**	**2.76**	**1.97**	**1.95**	**2.48**
Bis (2-chloroisopropyl) ether	0.31	Adjusted Tapwater RSL	**1.03 J**	0.617 U	5.88 U	0.549 U	**435 J**	**688 J**	**319**	**560**	**643**	**491**	**586 K**	**625**	**536**	**364**	**471**
Bis (2-ethylhexyl) phthalate	6	Adjusted Tapwater RSL	5.56 U	6.17 U	58.8 U	5.49 U	5.26 UL	5.15 U	5.56 U	5.81 U	5.43 U	5.26 U	5.32 U	5.38 U	5.62 U	5.88 U	5.38 U
Butyl benzylphthalate	16	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Di-n-butylphthalate	90	Adjusted Tapwater RSL	0.556 U	2.18 B	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	**0.659 K**	0.538 U	0.562 U	0.588 U	0.538 U
Fluoranthene	80	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Fluorene	29	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Naphthalene	0.17	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	**7.68 L**	**10.4 J**	**5.84**	**8.04 J**	**9.96**	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	**0.58**
Phenanthrene	--	--	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Phenol	580	Adjusted Tapwater RSL	**11.1**	0.617 U	5.88 U	0.549 U	0.526 U	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
Pyrene	12	Adjusted Tapwater RSL	0.556 U	0.617 U	5.88 U	0.549 U	0.526 UL	0.515 U	0.556 U	0.581 U	0.543 U	0.526 U	0.532 U	0.538 U	0.562 U	0.588 U	0.538 U
VOCs (µg/L)																	
1,2-Dichlorobenzene	600	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	75	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dioxane (p-Dioxane)	0.78	Adjusted Tapwater RSL	1.11 U	1.23 U	1.18 U	1.1 U	**274 J**	**285 J**	**258 L**	**228 L**	**207 L**	**260 J**	**313 J**	**254 L**	**203 L**	**211 L**	**227 L**
2-Butanone	560	Adjusted Tapwater RSL	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	120	Adjusted Tapwater RSL	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ
Acetone	1400	Adjusted Tapwater RSL	**9.48**	**14.5 L**	**6**	5 U	7.07 B	7.21 B	**5.35 L**	5 U	5 U	7.02 B	7.8 B	5 UL	5 U	5 U	5 U
Benzene	5	MCL	1 U	1 U	1 U	1 U	**31.2**	**31.3**	**30.3**	**28.7**	**27.5**	**12.6**	**21.7**	**20**	**17.3**	**17.4**	**18.6**
Carbon disulfide	81	MCL	1 U	1 UJ	1 U	1 UJ	1 UJ	1 UJ	**1.27**	1 U	1 U	1 UJ	1 UJ	1 U	1 U	1 U	1 UJ
Chlorobenzene	100	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
			1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	700	MCL	1 U	1 U	1 U	1 U	**23.3**	**22.2**	**21.2**	**21.7**	**20.5**	1 U	**4.81**	**4.4**	**4.51**	**4.31**	**4.24**
Methylene chloride	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Styrene	100	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	1000	MCL	1 U	1 U	1 U	1 U	**3.11**	**3.07**	**2.94**	**3.02**	**2.86**	1 U	**1.79 K**	**1.64**	**1.56**	**1.5**	**1.41**
trans-1,3-Dichloropropene	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl chloride	2	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
VOCs, Total	--	--	**9.48**	**14.5**	**6**	0 U	**347.84**	**357.76**	**327.9**	**290.76**	**266.4**	**280.74**	**352.06**	**282.74**	**229.1**	**236.89**	**253.8**
Xylenes, Total	10000	MCL	1 U	1 U	1 U	1 U	**9.16**	**8.98**	**8.84**	**9.34**	**8.54**	**1.12**	**2.96**	**2.7**	**2.73**	**2.68**	**2.55**

TABLE 4-1
2014 Detected Results for Ward Hollow Groundwater
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

Location			MW23				MW25	MW26				MW27	MW28						
Sample ID			MW23-GW-040114	MW23-GW-062714	MW23-GW-091114	MW23-GW-121914	MW25-GW-032814	MW26-GW-040314	MW26-GW-063014	MW26-GW-091214	MW26-GW-122014	MW27-GW-040114	MW28-GW-032814	MW28-GW-032814D	MW28-GW-062614	MW28-GW-062614D	MW28-GW-091014	MW28-GW-122014
Sample Date			4/1/2014	6/27/2014	9/11/2014	12/19/2014	3/28/2014	4/2/2014	6/30/2014	9/12/2014	12/20/2014	3/28/2014	3/28/2014	3/28/2014	6/26/2014	6/26/2014	9/10/2014	12/20/2014
Analyte	**Screening Level**	**Screening Level Source**																
Metals (mg/L)																		
Arsenic, dissolved	0.01	MCL	**0.169**	0.1 U	**0.0104**	**0.0458**	0.0122 B	0.1 U	0.01 U	0.01 U	0.01 U	**0.151**	**0.149**	**0.153**	0.1 U	0.1 U	0.01 U	0.01 U
Barium, dissolved	2	MCL	**36.3**	**37.2**	**39**	**42.5**	**1.9**	**57.5**	**60.1**	**56.7**	**61.5**	**35.7**	**35.3**	**35.6**	**35.5**	**34**	**34.3 K**	**37.9**
Cadmium, dissolved	0.005	MCL	0.001 U	0.01 U	**0.00216**	**0.00203**	0.001 U	0.01 U	**0.00129**	**0.00226**	**0.00228**	0.001 U	0.001 U	**0.00119**	0.01 U	0.01 U	**0.00201**	**0.00211**
Chromium, dissolved	0.1	MCL	0.005 U	0.05 U	**0.00683**	**0.00844**	0.005 U	0.05 U	0.005 U	**0.00585**	0.005 U	0.005 U	0.005 U	0.005 U	0.05 U	0.05 U	**0.00606**	0.005 U
Selenium, dissolved	0.05	MCL	0.001 U	**0.0137**	**0.0239**	0.0026	0.001 U	**0.0302**	**0.014**	**0.0194**	0.00316	**0.00116**	0.001 U	0.001 U	**0.0118**	**0.0117**	0.001 U	0.00509
SVOCs (µg/L)																		
2,4-Dimethylphenol	36	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 U	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
2,4-Dinitrotoluene	0.24	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	**3.25**	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	**1.02**
2,6-Dinitrotoluene	0.048	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	**3.71**	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
2-Chloronaphthalene	75	Adjusted Tapwater RSL	**1.16 K**	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
2-Methylnaphthalene	3.6	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 UL	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
2-Nitrophenol	--	--	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 U	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
3-Methylphenol & 4-Methylphenol	--	--	0.543 U	0.575 U	0.595 U	**1.82**	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 U	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
4-Nitrophenol	--	--	2.17 U	2.3 U	2.38 U	2 U	2.3 U	2.21 U	2.38 U	2.27 U	2.22 U	2.11 U	2.25 U	2.25 U	2 U	2.22 U	2.08 U	2.27 U
Acenaphthene	53	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Acenaphthylene	--	--	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Anthracene	180	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Bis (2-chloroethyl) ether	0.014	Adjusted Tapwater RSL	**1.07 J**	0.575 U	**1**	**0.964**	0.575 U	**2.53**	**1.72**	**2.33 J**	**2.4**	0.526 UL	**0.761 J**	**0.567 J**	0.5 U	0.556 U	0.521 U	0.568 U
Bis (2-chloroisopropyl) ether	0.31	Adjusted Tapwater RSL	**304 J**	**144**	**508**	**303**	0.575 U	**550 J**	**416**	**531**	**482**	**84.6 L**	**281 J**	**210 J**	**95.3**	**98.1**	**263**	**104**
Bis (2-ethylhexyl) phthalate	6	Adjusted Tapwater RSL	5.43 U	5.75 U	5.95 U	**6.1 K**	5.75 U	5.52 U	5.95 U	5.68 U	5.56 U	5.26 UL	5.62 U	5.62 U	5 U	5.56 U	5.21 U	5.68 U
Butyl benzylphthalate	16	Adjusted Tapwater RSL	**0.653 K**	0.575 U	0.595 U	0.5 U	**0.762 K**	0.552 U	0.595 U	0.568 U	0.556 U	**0.688 L**	**0.616 K**	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Di-n-butylphthalate	90	Adjusted Tapwater RSL	0.698 B	0.575 U	0.595 U	0.5 U	1.53 B	0.552 U	0.595 U	0.568 U	0.556 U	0.848 B	0.779 B	0.562 U	**0.632**	**0.747**	0.521 U	0.568 U
Fluoranthene	80	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Fluorene	29	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Naphthalene	0.17	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Phenanthrene	--	--	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Phenol	580	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	**1.17**	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 U	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
Pyrene	12	Adjusted Tapwater RSL	0.543 U	0.575 U	0.595 U	0.5 U	0.575 U	0.552 U	0.595 U	0.568 U	0.556 U	0.526 UL	0.562 U	0.562 U	0.5 U	0.556 U	0.521 U	0.568 U
VOCs (µg/L)																		
1,2-Dichlorobenzene	600	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	75	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dioxane (p-Dioxane)	0.78	Adjusted Tapwater RSL	**393**	**240 L**	**203 L**	**218 L**	**4.16**	**291 J**	**215 L**	**220 L**	**221 L**	**366**	**353**	**364**	**184 L**	**206 L**	**177 L**	**209 L**
2-Butanone	560	Adjusted Tapwater RSL	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-Methyl-2-pentanone	120	Adjusted Tapwater RSL	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ
Acetone	1400	Adjusted Tapwater RSL	**7.95**	**6.82 L**	**11.8**	**8.67**	5 U	6.49 B	5 UL	5 U	5 U	5 U	5 U	5 U	5 UL	5 UL	5 U	5 U
Benzene	5	MCL	**4.6**	**4.32**	**2.56**	**3.61**	1 U	**20.2**	**17.1**	**17.9**	**15.9**	**5.15**	**3.83**	**4.04**	**3.36**	**3.38**	**2.45**	**2.92**
Carbon disulfide	81	MCL	1 UJ	1 U	1 U	1 UJ	1 U	1 UJ	1 U	1 U	1 UJ	1 UJ	1 UJ	1 UJ	1 U	1 U	1 U	1 UJ
Chlorobenzene	100	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
			1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	700	MCL	1 U	1 U	1 U	1 U	1 U	**2.49**	**1.85**	**2.38**	**1.87**	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Styrene	100	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Toluene	1000	MCL	1 U	1 U	1 U	1 U	1 U	**1.41**	**1.1**	**1.35**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
trans-1,3-Dichloropropene	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl chloride	2	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
VOCs, Total	--	--	**405.55**	**251.14**	**217.36**	**230.28**	**4.16**	**323.74**	**236.67**	**243.6**	**240.4**	**371.15**	**356.83**	**368.04**	**187.36**	**209.38**	**179.45**	**211.92**
Xylenes, Total	10000	MCL	1 U	1 U	1 U	1 U	1 U	**2.15**	**1.62**	**1.97**	**1.63**	1 U	1 U	1 U	1 U	1 U	1 U	1 U

TABLE 4-1
2014 Detected Results for Ward Hollow Groundwater
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

Location			MW31				MW32				P06	P11	Lower Ward Leachate Collection System			
Sample ID			MW31-GW-032614	MW31-GW-060514	MW31-GW-090914	MW31-GW-121814	MW32-GW-032614	MW32-GW-060514	MW32-GW-090914	MW32-GW-121814	P06-GW-032514	P11-GW-032614	730-WL-032714	730-WL-070214	730-WL-091014	730-SW01-121814
Sample Date			3/26/2014	6/5/2014	9/9/2014	12/18/2014	3/26/2014	6/5/2014	9/9/2014	12/18/2014	3/25/2014	3/26/2014	3/27/2014	7/2/2014	9/10/2014	12/18/2014
Analyte	**Screening Level**	**Screening Level Source**														
Metals (mg/L)																
Arsenic, dissolved	0.01	MCL	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.0142**
Barium, dissolved	2	MCL	**0.516**	**0.802**	**0.589**	**0.716**	**0.178**	**0.177**	**0.189**	**0.184**	**0.979**	**1.26**	**4.85**	**5.78**	**4.75**	**5.01**
Cadmium, dissolved	0.005	MCL	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.00101**	0.001 U	0.001 U	0.001 U
Chromium, dissolved	0.1	MCL	**0.00923**	0.005 U	0.005 U	0.005 U	**0.0421**	**0.0067**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, dissolved	0.05	MCL	**0.00241**	**0.00524**	**0.00292**	**0.00332**	**0.00328**	0.001 U	0.001 U	0.001 U	**0.00298**	**0.00912**	**0.0184**	**0.0166**	**0.018**	**0.0187**
SVOCs (µg/L)																
2,4-Dimethylphenol	36	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	**61.1 K**	**70.5**	0.581 U	**75.6**
2,4-Dinitrotoluene	0.24	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	**49.7**	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 UJ	0.581 U	0.532 U
2,6-Dinitrotoluene	0.048	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	**50.1**	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 UJ	0.581 U	0.532 U
2-Chloronaphthalene	75	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 UJ	0.581 U	0.532 U
2-Methylnaphthalene	3.6	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	**65.2 K**	**62.8**	**95.6 K**	**64**
2-Nitrophenol	--	--	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 UJ	0.581 U	0.532 U
3-Methylphenol & 4-Methylphenol	--	--	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	**81.3**	0.581 U	0.532 U
4-Nitrophenol	--	--	2.13 U	2.25 U	2.11 U	2.44 U	2.22 U	2.25 U	2.2 U	2.15 U	21.1 U	21.1 U	11.5 U	2.22 UJ	2.33 U	2.13 U
Acenaphthene	53	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	**33.2 K**	**31.3**	**10.6 K**	**35.8**
Acenaphthylene	--	--	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	**9.04 K**	**8.17**	**4.21 K**	**6.46**
Anthracene	180	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	**1.96 K**	**2.33 K**	**2.21**
Bis (2-chloroethyl) ether	0.014	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 U	0.581 U	0.532 U
Bis (2-chloroisopropyl) ether	0.31	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	**1.55 J**	0.562 U	0.549 U	0.538 U	**897**	**1090 J**	**1160 J**	**1010**	**1240**	**1350**
Bis (2-ethylhexyl) phthalate	6	Adjusted Tapwater RSL	5.32 U	5.62 U	**6.04**	**8.59 K**	5.56 U	5.62 U	5.49 U	5.38 U	52.6 U	52.6 U	28.7 U	5.56 U	5.81 U	5.32 U
Butyl benzylphthalate	16	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 U	0.581 U	0.532 U
Di-n-butylphthalate	90	Adjusted Tapwater RSL	0.532 U	1.58 B	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	1.13 B	5.26 U	5.26 U	2.87 U	0.556 U	0.581 U	0.532 U
Fluoranthene	80	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 U	**0.659**	**0.538**
Fluorene	29	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	**24.5 K**	**22.3**	**8.11**	**17.3**
Naphthalene	0.17	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	**0.83 K**	0.562 U	0.549 U	0.538 U	**46.9 K**	**512 K**	**421 K**	**291**	**392**	**388**
Phenanthrene	--	--	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	**19.6**	**15.3 K**	**15.2**	**14.8**
Phenol	580	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	**5.51**	**518**	**424**	0.581 U	**519**
Pyrene	12	Adjusted Tapwater RSL	0.532 U	0.562 U	0.526 U	0.61 U	0.556 U	0.562 U	0.549 U	0.538 U	5.26 U	5.26 U	2.87 U	0.556 U	**0.841**	**0.791**
VOCs (µg/L)																
1,2-Dichlorobenzene	600	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**1.39**	1 U	**2.01**	**3.02**	**3.06**	**1.68**
1,2-Dichloroethane	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**180**	**19**	**20.6**	**17.3**	**17.1**
1,2-Dichloropropane	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**349**	**91.3**	**120**	**103**	**94.5**
1,3-Dichlorobenzene	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**3.04**	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	75	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**4.49**	1 U	1 U	1 U	1 U	1 U
1,4-Dioxane (p-Dioxane)	0.78	Adjusted Tapwater RSL	**3.77**	**5.43**	**5.26**	**6.88**	1.11 U	1.12 U	1.1 U	1.08 U	**11.9**	**23.7**	**123**	**161 L**	**150**	**144 J**
2-Butanone	560	Adjusted Tapwater RSL	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	**8.91**	**8.92**	**10.1**	**9.29**
4-Methyl-2-pentanone	120	Adjusted Tapwater RSL	5 U	5 U	5 UL	5 U	5 U	5 U	5 UL	5 U	5 U	5 U	**17.8**	**22.6**	**24.3**	**22.4**
Acetone	1400	Adjusted Tapwater RSL	5 U	5 UL	5 UL	5 U	**94.5**	**141 L**	43.3 B	5 U	**11.5**	**28.3**	**105**	**98.8 L**	**129**	**165**
Benzene	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**30.3**	**46.9**	**48.7**	**66.7 K**	**50.8**	**45.8**
Carbon disulfide	81	MCL	1 U	1 UJ	1 U	1 U	1 U	1 UJ	1 U	1 U	**3.11**	**2.37**	1 U	1 U	1 U	1 U
Chlorobenzene	100	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**250**	1 U	**4.01**	**5.22**	**5.64**	1 U
			1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**3.35**	1 U	1 U
Ethylbenzene	700	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**59.9**	**149**	**78.8**	**102**	**89.7**	**78.5**
Methylene chloride	5	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**4.66**	1 U	1 U	1 U	1 U
Styrene	100	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**3.5**	**118**	**14.2**	**22.7**	**18.3**	**11**
Toluene	1000	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**10.8**	**163**	**106**	**141**	**133**	**67.7**
trans-1,3-Dichloropropene	--	--	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**2.05**	1 U
Vinyl chloride	2	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**5.65**	1 U	1 U	1 U	1 U
VOCs, Total	--	--	**3.77**	**5.43**	0 U	**6.88**	**94.5**	**141**	**43.3**	0 U	**441.13**	**1333.58**	**696.23**	**872.11**	**817.75**	**725.27**
Xylenes, Total	10000	MCL	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**51.2**	**263**	**77.5**	**96.2**	**81.5**	**68.3**

TABLE 4-1
2014 Detected Results for Ward Hollow Groundwater
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

Notes:

NA = Not analyzed
A few analytes had reporting limits higher than screening levels; however, the sampling objectives were still achieved and these instances do not affect our ability to effectively monitor groundwater conditions at the site.
B = The analyte was detected in the associated method and/or calibration blank.
J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
K = The analyte was positively identified, but the associated numerical value may be biased high.
L = The analyte was positively identified, but the associated numerical value may be biased low.
R = The sample results are rejected due to serious deficiencies in the ability to analyze the sample and to meet the quality control criteria. The presence or absence of the analyte cannot be verified.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.
UL = The analyte was analyzed for but was not detected. The quantitation limit may be biased low.
mg/l = Milligrams per Liter
µg/l = Micrograms per Liter
MCL= Maximum contaminant level
RSL= Regional screening level
Bold indicates the analyte was detected
Shading indicates the result exceeded screening criteria

TABLE 4-2

2014 Detected Results for Greenhouse Area Groundwater

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Location			MW-104A	WVU-MW04
Sample ID			MW104A-GW-032613	WVUMW04-GW-032713
Sample Date			9/10/2014	9/10/2014
Analyte	**Screening Level**	**Screening Level Source**		
VOCs (µg/L)				
Acetone	1400	Adjusted Tapwater RSL	5 U	**5.71**
cis-1,2-Dichloroethylene	70	MCL	**1.27**	1 U
Tetrachloroethene	5	MCL	**1.77**	**7.12**
Trichloroethylene	5	MCL	1 U	**1.36**
VOCs, Total	--	--	**3.04**	**14.19**

Notes:

A few analytes had reporting limits higher than screening levels; however, the sampling objectives were still achieved and these instances do not affect our ability to effectively monitor groundwater conditions at the site.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

µg/l = Micrograms per Liter.

MCL= Maximum contaminant level.

RSL= Regional screening level.

Bold indicates the analyte was detected.

Shading indicates the result exceeded screening criteria.

Figures

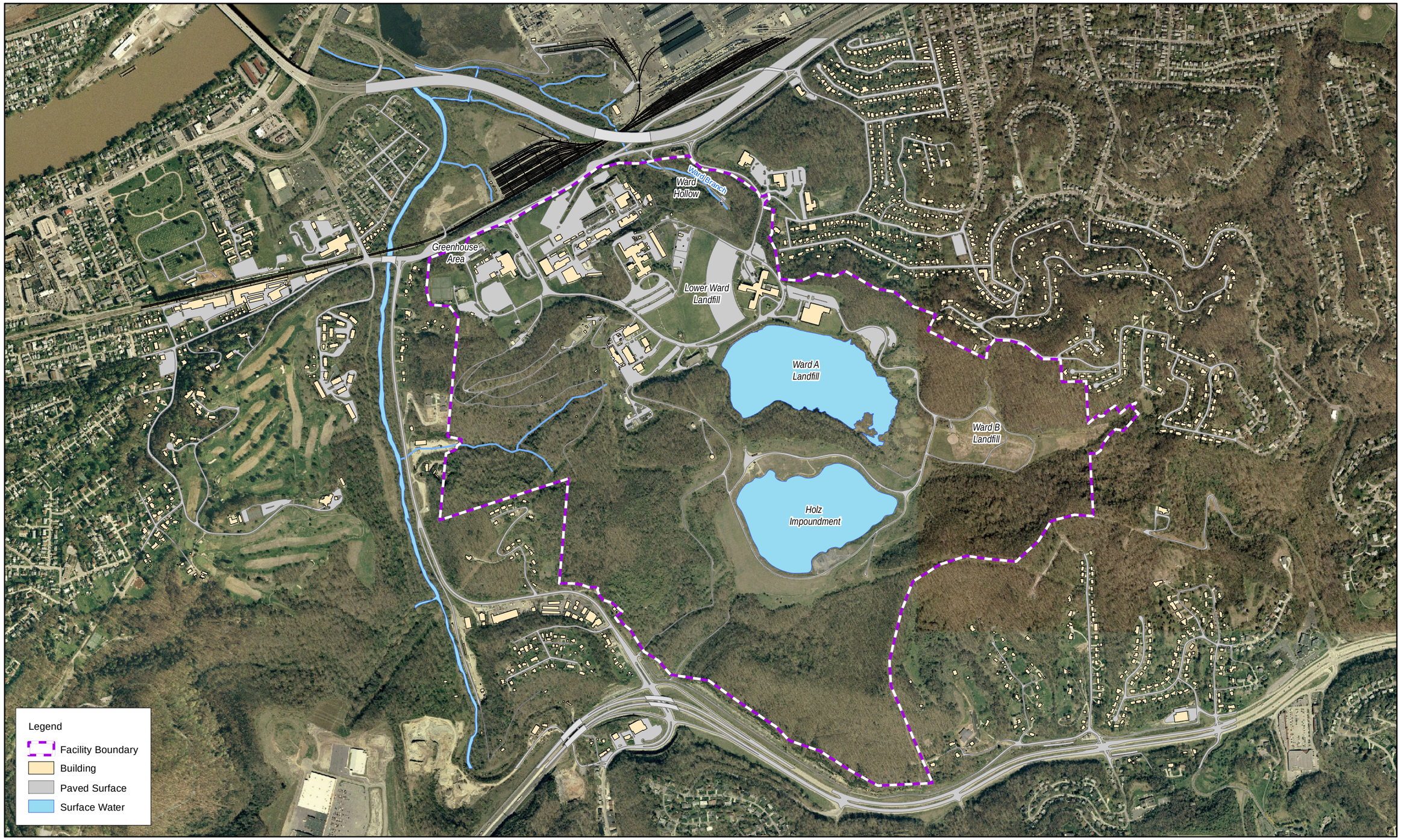

Figure 1-1
Facility Location Map
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

CH2MHILL

MKE \\LAKEFRONT\PROJ\GIS\DOW\TECHCENTER\REPORTS\2015\GWREPORT2014\MAPFILES\FIGURE 01-01 - FACILITY LOCATION MAP.MXD JHANSEN1 1/30/2015 9:24:04 AM

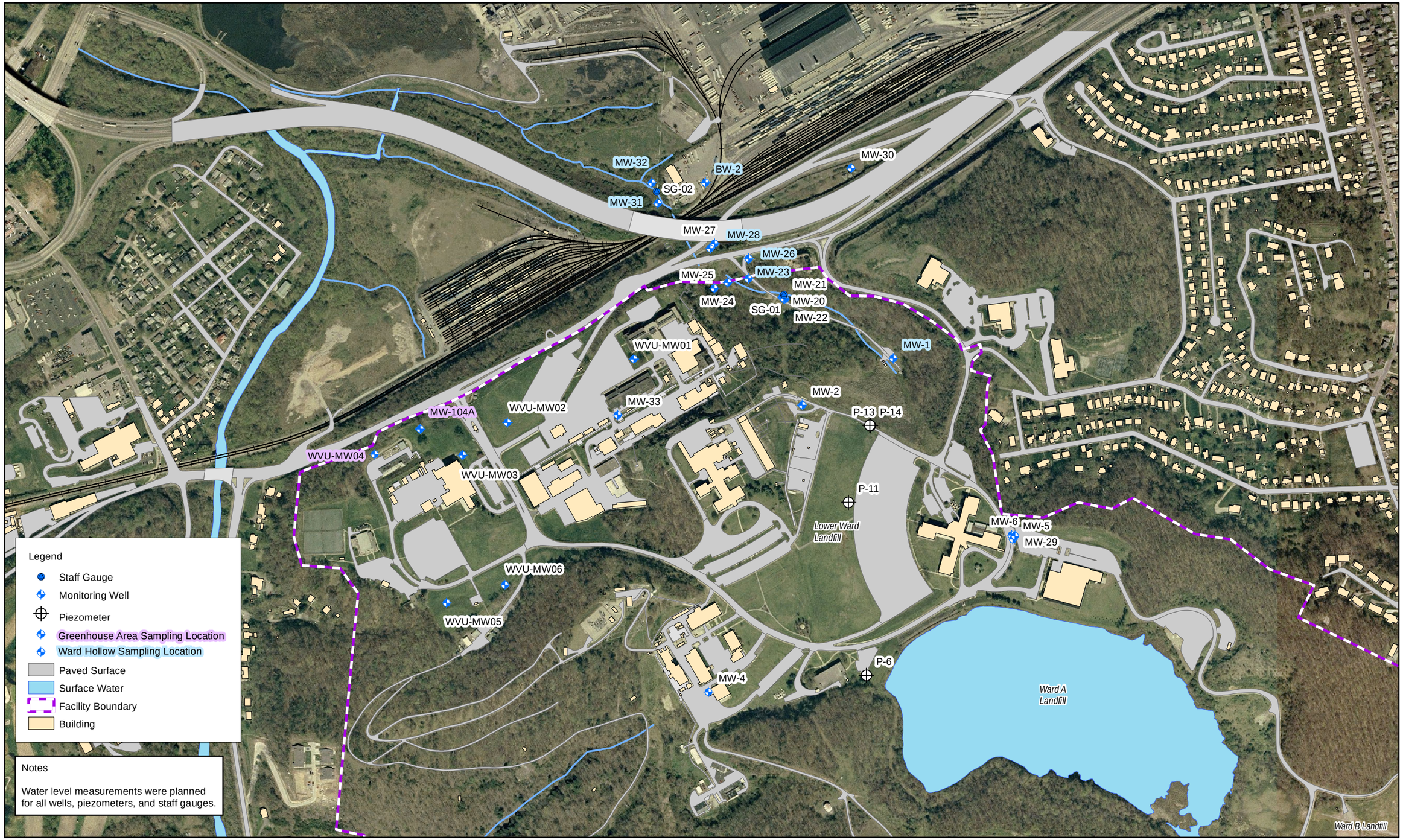

Figure 3-1
Water Level and Groundwater Sampling Locations
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

CH2MHILL

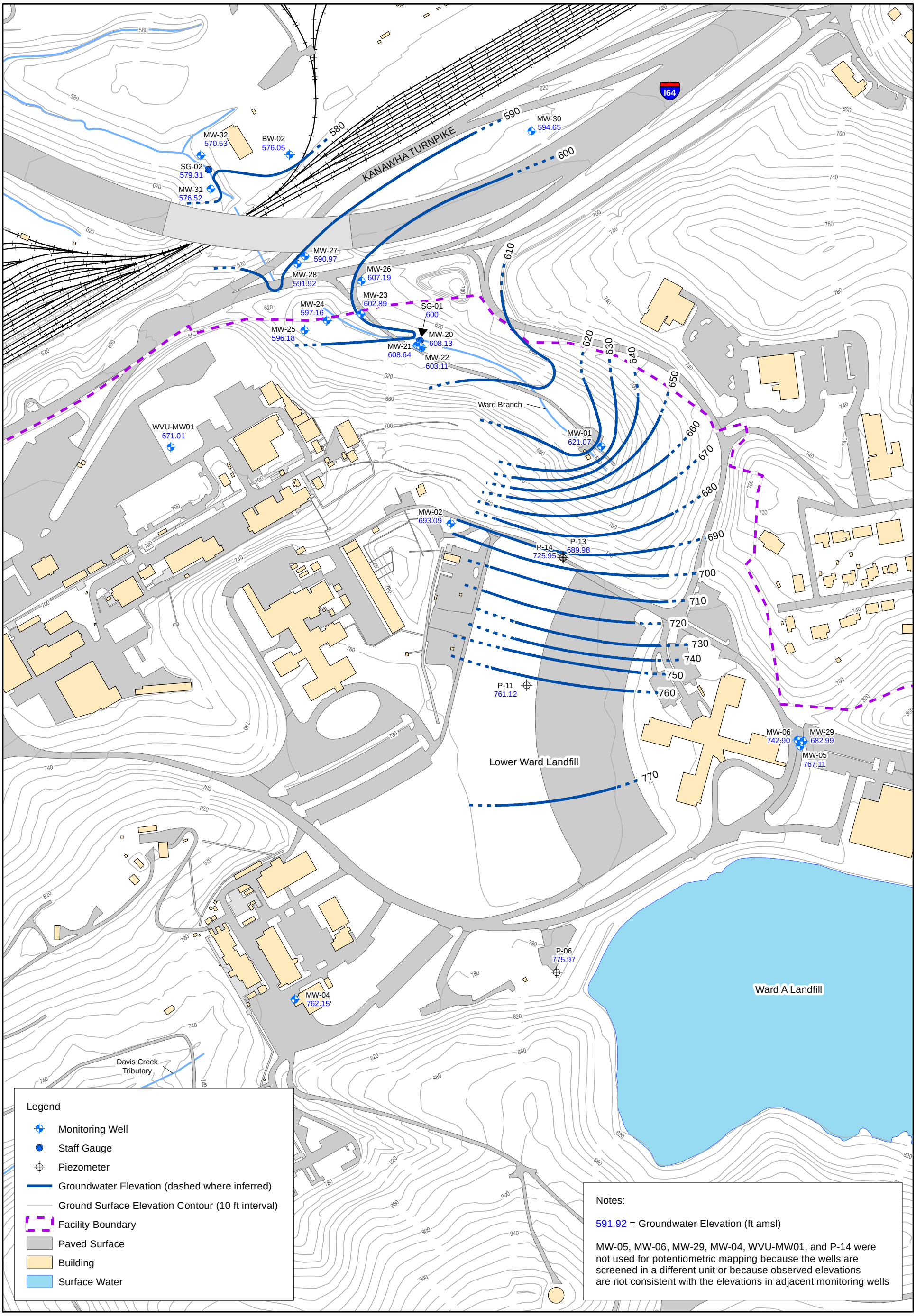

Figure 4-1
September 2014 Ward Hollow Upper Freeport Potentiometric Surface Map
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

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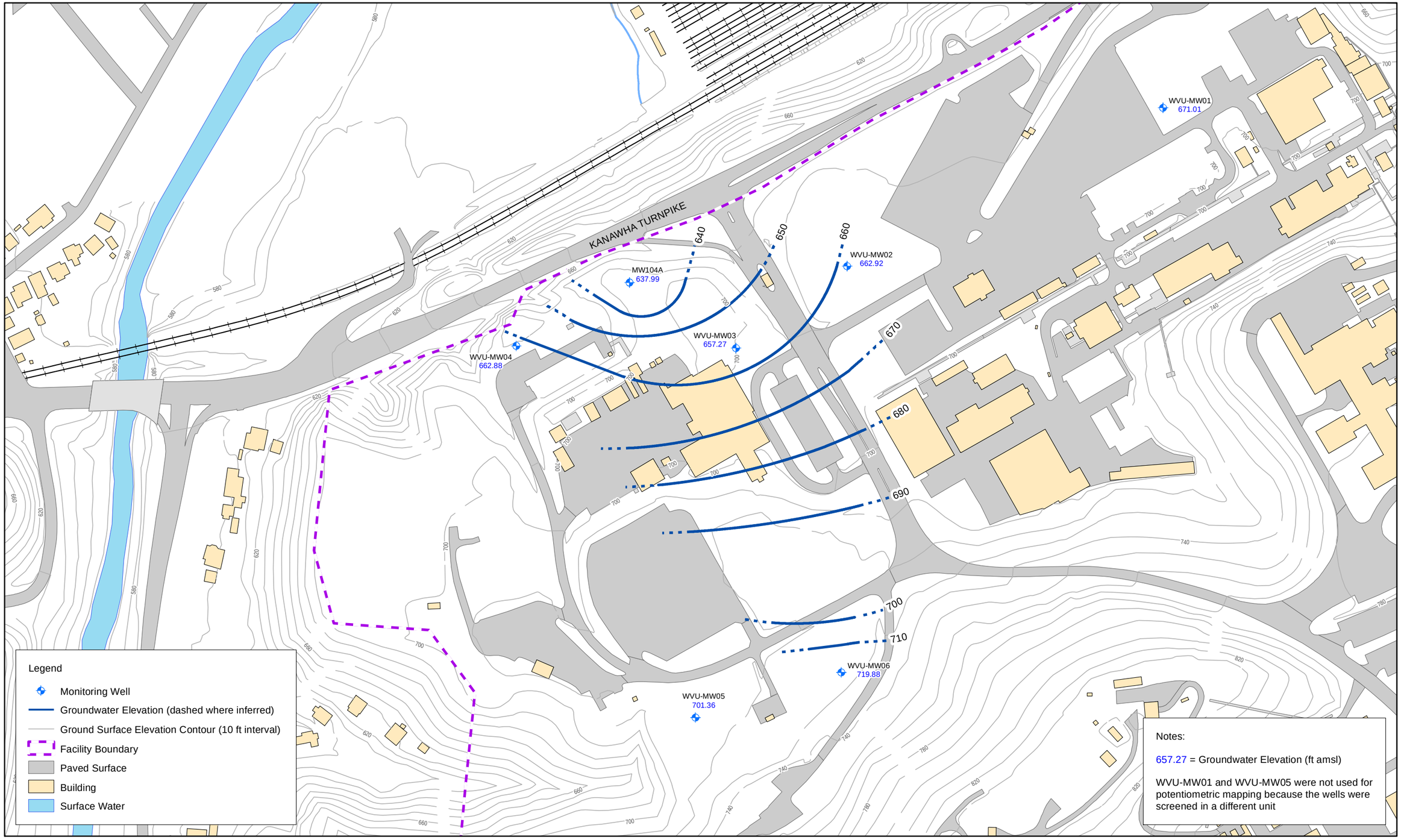

Figure 4-2
September 2014 Mahoning Sandstone Potentiometric Surface Near the Greenhouse Area
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

CH2MHILL

MKE \\LAKEFRONT\PROJ\GIS\DOW\TECHCENTER\REPORTS\2015\GWREPORT2014\MAPFILES\FIGURE 04-02 - UPPER MAHONING SANDSTONE POT SURF NEAR THE GREENHOUSE AREA.MXD JHANSEN1 3/5/2015 10:57:43 AM

Figure 4-3
September 2014 1,4-Dioxane Isoconcentration Map
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

CH2MHILL

MKE \\LAKEFRONT\PROJ\GIS\DOW\TECHCENTER\REPORTS\2015\GWREPORT2014\MAPFILES\FIGURE 04-03 - 1,4-DIOXANE ISOCONCENTRATION MAP.MXD JHANSEN1 3/4/2015 1:23:53 PM

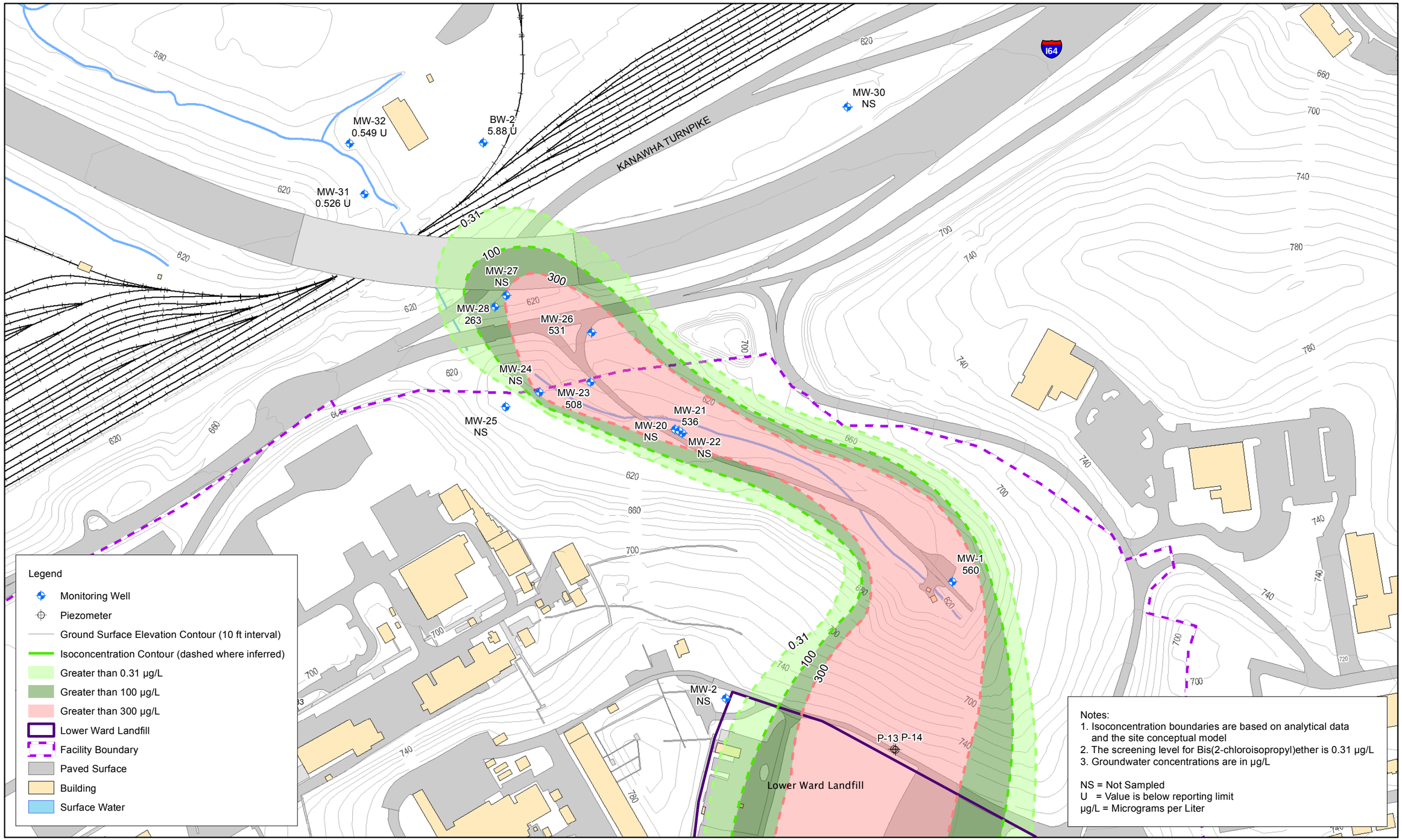

Figure 4-4
September 2014 Bis(2-chloroisopropyl)ether Isoconcentration Map
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

CH2MHILL

MKE \\LAKEFRONT\PROJ\GIS\DOW\TECHCENTER\REPORTS\2015\GWREPORT2014\MAPFILES\FIGURE 04-04 - BIS(2-CHLOROISOPROPYL)ETHER ISOCONCENTRATION MAP.MXD JHANSEN1 3/4/2015 1:35:06 PM

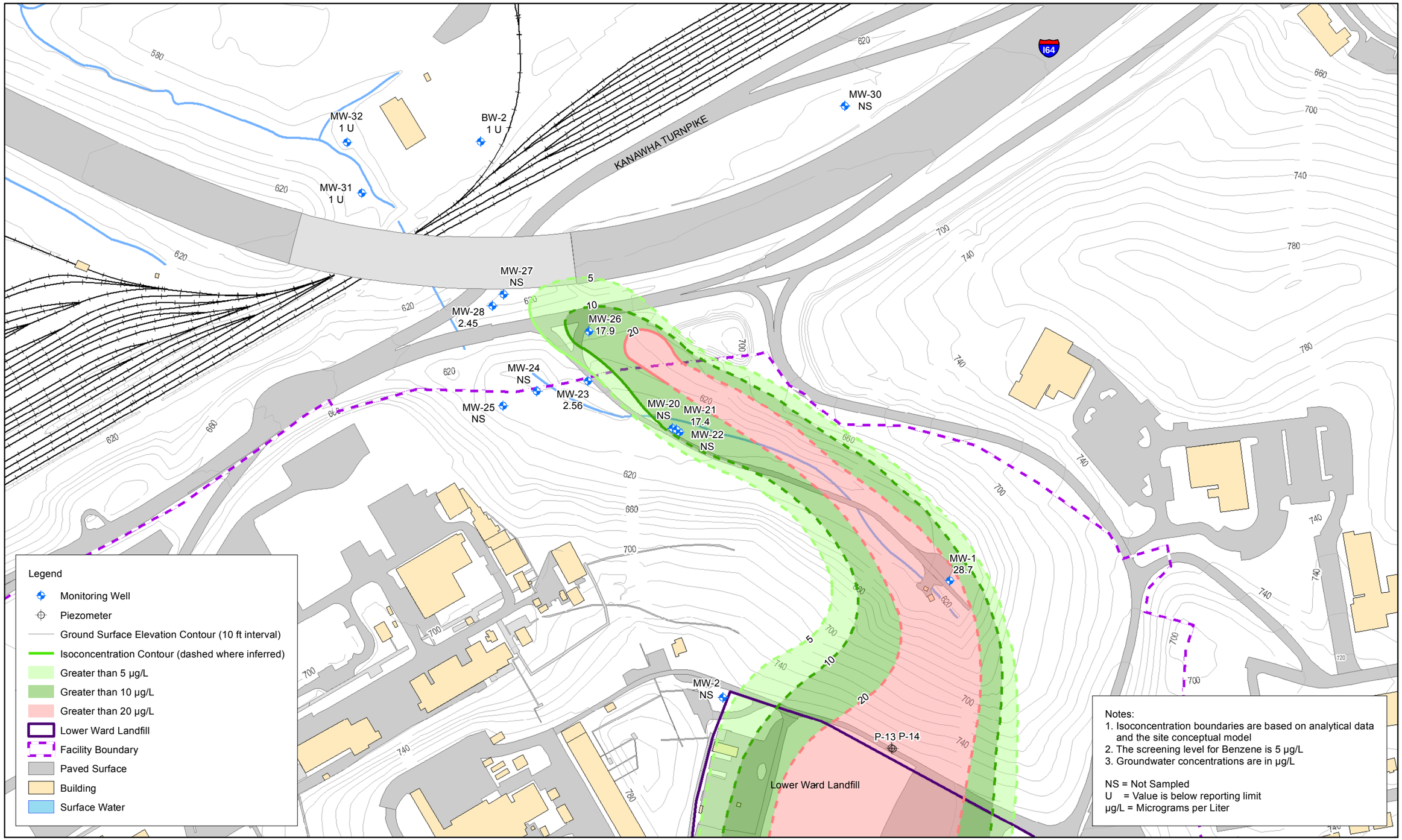

Figure 4-5
September 2014 Benzene Isoconcentration Map
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

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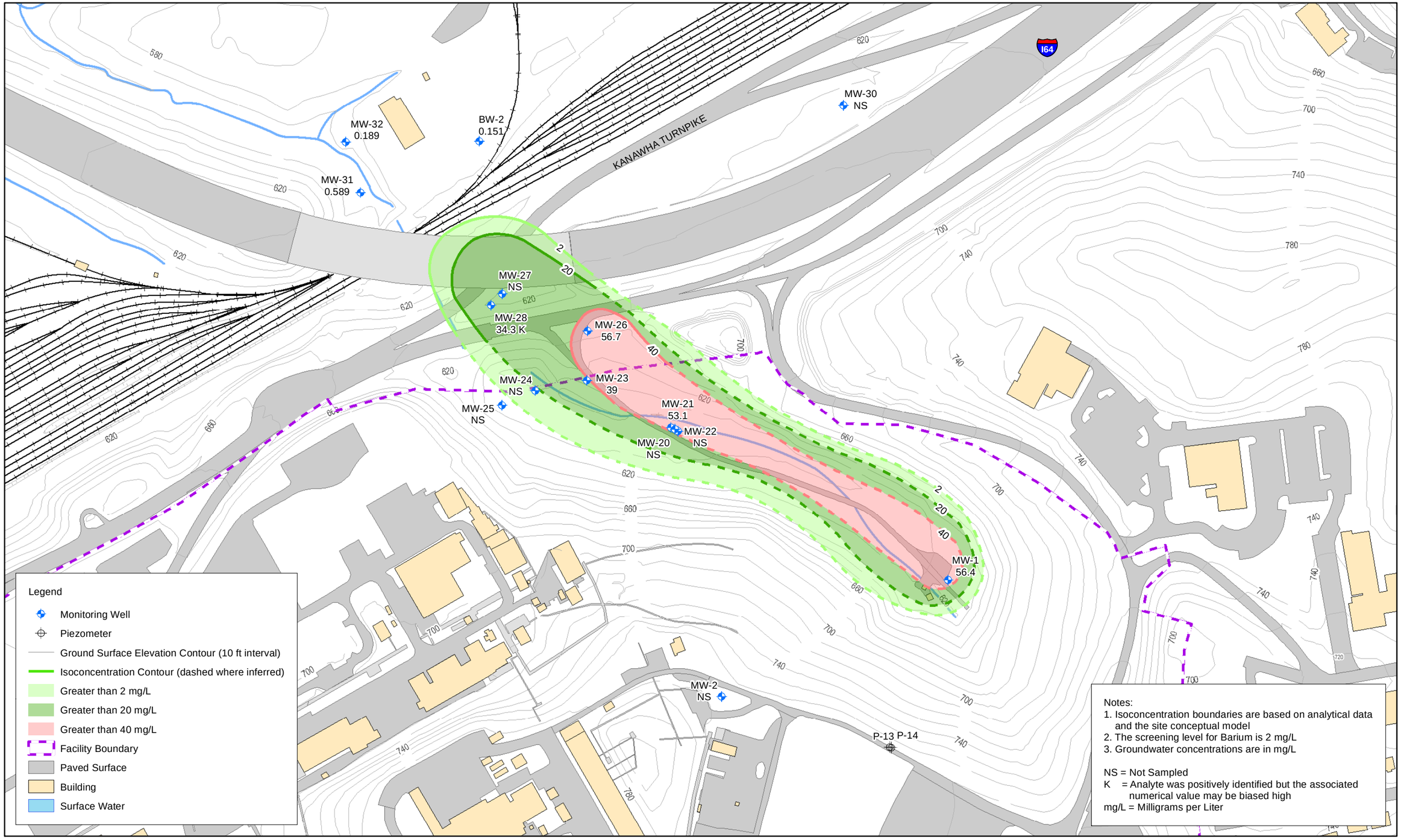

Figure 4-6
September 2014 Dissolved Barium Isoconcentration Map
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

CH2MHILL

MKE \\LAKEFRONT\PROJ\GIS\DOW\TECHCENTER\REPORTS\2015\GWREPORT2014\MAPFILES\FIGURE 04-06 - DISSOLVED BARIUM ISOCONCENTRATION MAP.MXD JHANSEN1 2/3/2015 4:04:52 PM

Analyte	Screening Level (µg/L)	Screening Level Source
Acetone	1400	Adjusted Tapwater RSL
cis-1,2-Dichloroethylene	70	MCL
Tetrachloroethylene	5	MCL
Trichloroethylene	5	MCL

WVU-MW04	µg/L
Acetone	5.71
Tetrachloroethylene	7.12
Trichloroethylene	1.36

MW-104A	µg/L
cis-1,2-Dichloroethene	1.27
Tetrachloroethylene	1.77

WVU-MW01
NS

WVU-MW02
NS

MW-33
NS

WVU-MW03
NS

WVU-MW06
NS

WVU-MW05
NS

Legend
- Monitoring Well
- Ground Surface Elevation Contour (10 ft interval)
- Facility Boundary
- Paved Surface
- Building
- Surface Water

Note:
Result in red exceed screening level
NS = Not Sampled
ug/l = Micrograms per Liter
MCL= Maximum contaminant level
RSL= Regional screening level

N

0 200 400
Feet

Figure 4-7
September 2014 Greenhouse Area Groundwater Detections and Exceedances
2014 Groundwater Monitoring Report
UCC Technology Park
South Charleston, West Virginia

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Appendix A

Laboratory Analytical Data Reports and Data Quality Evaluation Report

The laboratory analytical data reports and data quality evaluation report are provided on the attached CD-ROM.

Appendix B

Mann-Kendall Results for Plume Stability (Summary Tables and Trend Graphs)

TABLE B-1

Nonparametric (Mann-Kendall) Trend Analysis for 1,4- Dioxane, Individual Monitoring Wells

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Monitoring Well	No. of Detected Samples	No. of Nondetected Samples	Total Samples	Detection Frequency (%)	Minimum (µg/L)	Maximum (µg/L)	Mean (µg/L)	Median (µg/L)	Mann-Kendall Result (% Confidence)	Trend	Stability
MW-01	22	0	22	100	100	347	191	190	76.8% (+)	**No Trend**	**Stable**
MW-23	22	0	22	100	98.4	393	226	217	88.7% (-)	**No Trend**	**Stable**
MW-26	22	0	22	100	141	318	228	220	80.9% (-)	**No Trend**	**Stable**
MW-28	22	0	22	100	100	364	193	186	58.9% (+)	**No Trend**	**Stable**
BW-02	3	16	19	16	0.257	3.06	0.605	0.257	NA	>50% ND	NA
MW-31	9	12	21	43	0.257	16.4	2.55	0.257	NA	>50% ND	NA
MW-32	0	22	22	0	0.257	0.257	0	0	NA	>50% ND	NA

Notes:

µg/L = micrograms per liter.

NA = not applicable.

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set.

>50% ND = greater than 50 percent nondetects.

Trend analysis performed using Mann Kendall single-tailed test at 0.05 significance level.

For monitoring points exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

- A weak trend (either increasing or decreasing) will be indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For a constituent exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

(-) = negative trend

(+) = positive trend

TABLE B-2

Nonparametric (Mann-Kendall) Trend Analysis for Bis (2-chloroisopropyl)ether, Individual Monitoring Wells

2014Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Monitoring Well	No. of Detected Samples	No. of Nondetected Samples	Total Samples	Detection Frequency (%)	Minimum (µg/L)	Maximum (µg/L)	Mean (µg/L)	Median (µg/L)	Mann-Kendall Result (% Confidence)	Trend	Stability
MW-01	23	0	23	100	143	796	387	388	100.0% (sig +)	**Increasing Trend**	NA
MW-23	23	0	23	100	54.3	508	219	200	97.5% (sig +)	**Increasing Trend**	NA
MW-26	23	0	23	100	181	674	420	431	100.0% (sig +)	**Increasing Trend**	NA
MW-28	23	0	23	100	56.9	281	139	131	83.6% (+)	**No Trend**	**Stable**
BW-02	1	16	17	6	0	1	0	0	NA	>50% ND	NA
MW-31	0	20	20	0	0	0	0	0	NA	>50% ND	NA
MW-32	1	19	20	5	0	2	0	0	NA	>50% ND	NA

Notes:

µg/L = micrograms per liter.

NA = not applicable.

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set.

>50% ND = greater than 50 percent nondetects.

Trend analysis performed using Mann Kendall single-tailed test at 0.05 significance level.

For monitoring points exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

- A weak trend (either increasing or decreasing) will be indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For a constituent exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

(+) = positive trend

TABLE B-3

Nonparametric (Mann-Kendall) Trend Analysis for Benzene, Individual Monitoring Wells

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Monitoring Well	No. of Detected Samples	No. of Nondetected Samples	Total Samples	Detection Frequency (%)	Minimum (µg/L)	Maximum (µg/L)	Mean (µg/L)	Median (µg/L)	Mann-Kendall Result (% Confidence)	Trend	Stability
MW-01	22	0	22	100	9.66	31.3	23.3	23.5	100.0% (sig +)	Increasing Trend	NA
MW-23	21	1	22	95	0	9.29	3.81	2.90	88.2% (+)	No Trend	Stable
MW-26	22	0	22	100	6.60	20.2	14.8	15.9	100.0% (sig +)	Increasing Trend	NA
MW-28	19	3	22	86	0	7.41	2.61	2.45	99.7% (sig +)	Increasing Trend	NA
BW-02	4	16	20	20	0	13.9	1.55	0	NA	>50% ND	NA
MW-31	6	16	22	27	0	4.46	0.945	0	NA	>50% ND	NA
MW-32	3	19	22	14	0	14.4	1.12	0	NA	>50% ND	NA

Notes:

µg/L = micrograms per liter.

NA = not applicable.

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set.

>50% ND = greater than 50 percent nondetects.

Trend analysis performed using Mann Kendall single-tailed test at 0.05 significance level.

For monitoring points exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

- A weak trend (either increasing or decreasing) will be indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For a constituent exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

(+) = positive trend

TABLE B-4

Nonparametric (Mann-Kendall) Trend Analysis for Barium, Individual Monitoring Wells

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Monitoring Well	No. of Detected Samples	No. of Nondetected Samples	Total Samples	Detection Frequency (%)	Minimum (mg/L)	Maximum (mg/L)	Mean (mg/L)	Median (mg/L)	Mann-Kendall Result (% Confidence)	Trend	Stability
MW-01	18	0	18	100	39.8	61.3	55.1	56.1	95.2% (sig +)	Increasing Trend	NA
MW-23	21	0	21	100	25.0	42.5	33.6	32.8	99.6% (sig +)	Increasing Trend	NA
MW-26	21	0	21	100	43.7	61.5	55.8	56.7	96.5% (sig +)	Increasing Trend	NA
MW-28	21	0	21	100	12.7	37.9	30.5	32.8	99.9% (sig +)	Increasing Trend	NA
BW-02	14	1	15	93	0	0.678	0.143	0.054	94.3% (-)	No Trend	Not Stable
MW-31	18	0	18	100	0.146	1.17	0.414	0.303	64.8% (+)	No Trend	Stable
MW-32	18	0	18	100	0.065	0.603	0.169	0.156	98.8% (sig +)	Increasing Trend	NA

Notes:

mg/L = micrograms per liter.

NA = not applicable.

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set.

Trend analysis performed using Mann Kendall single-tailed test at 0.05 significance level.

For monitoring points exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

- A weak trend (either increasing or decreasing) will be indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For a constituent exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

(-) = negative trend

(+) = positive trend

TABLE B-5

Nonparametric (Mann-Kendall) Trend Analysis for Tetrachloroethylene, Individual Monitoring Wells

2014Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Monitoring Well	No. of Detected Samples	No. of Nondetected Samples	Total Samples	Detection Frequency (%)	Minimum (µg/L)	Maximum (µg/L)	Mean (µg/L)	Median (µg/L)	Mann-Kendall Result (% Confidence)	Trend	Stability
MW-104A	9	4	13	69	0	13.8	3.37	2.41	88.6% (+)	No Trend	Not Stable
WVU-MW04	13	0	13	100	7.1	58.7	34.4	35.3	57.1% (-)	No Trend	Stable

Notes:

µg/L = micrograms per liter.

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set.

Trend analysis performed using Mann Kendall single-tailed test at 0.05 significance level.

For monitoring points exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

- A weak trend (either increasing or decreasing) will be indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For a constituent exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

(-) = negative trend

(+) = positive trend

TABLE B-6

Nonparametric (Mann-Kendall) Trend Analysis for Trichloroethylene, Individual Monitoring Wells

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Monitoring Well	No. of Detected Samples	No. of Nondetected Samples	Total Samples	Detection Frequency (%)	Minimum (µg/L)	Maximum (µg/L)	Mean (µg/L)	Median (µg/L)	Mann-Kendall Result (% Confidence)	Trend	Stability
MW-104A	0	13	13	0	0	0	0	0	NA	>50% ND	NA
WVU-MW04	13	0	13	100	1.4	7.0	4.1	4.3	84.7% (-)	**No Trend**	**Stable**

Notes:

µg/L = micrograms per liter.

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set.

>50% ND = greater than 50 percent nondetects.

Trend analysis performed using Mann Kendall single-tailed test at 0.05 significance level.

For monitoring points exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

- A weak trend (either increasing or decreasing) will be indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For a constituent exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

(-) = negative trend

TABLE B-7

Nonparametric (Mann-Kendall) Trend Analysis for Chloroform, Individual Monitoring Wells

2014 Groundwater Monitoring Report

UCC Technology Park, South Charleston, West Virginia

Monitoring Well	No. of Detected Samples	No. of Nondetected Samples	Total Samples	Detection Frequency (%)	Minimum (µg/L)	Maximum (µg/L)	Mean (µg/L)	Median (µg/L)	Mann-Kendall Result (% Confidence)	Trend	Stability
MW-104A	5	8	13	38	0.257	1.42	0.637	0.257	NA	>50% ND	NA
WVU-MW04	10	3	13	77	0.257	1.46	1.04	1.19	100.0% (sig -)	**Decreasing Trend**	NA

Notes:

µg/L = micrograms per liter.

NA = not applicable.

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set.

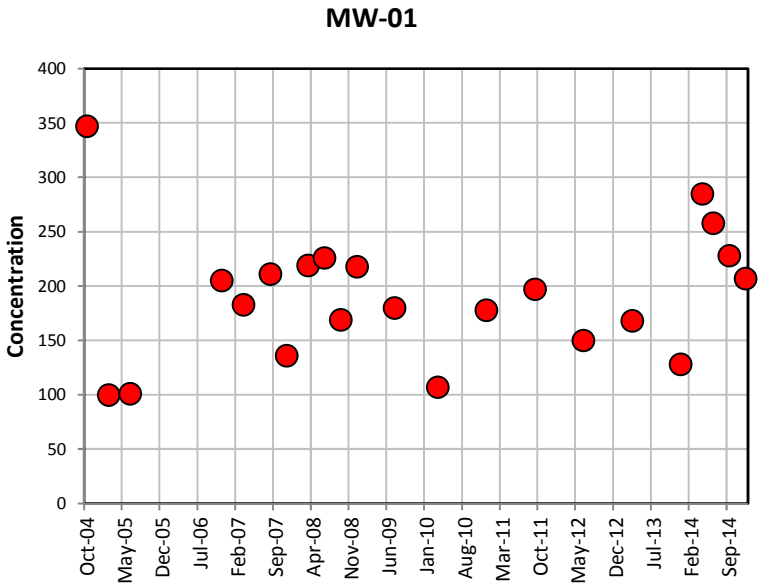
>50% ND = greater than 50 percent nondetects.

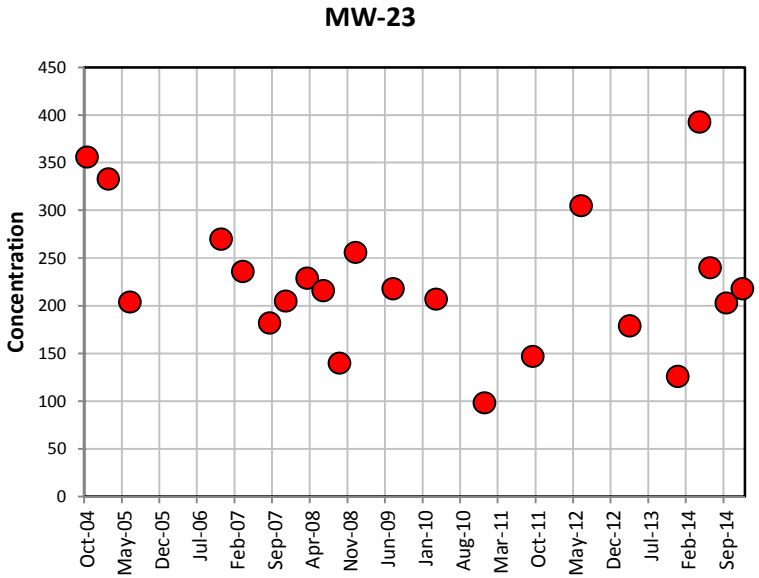
Trend analysis performed using Mann Kendall single-tailed test at 0.05 significance level.

For monitoring points exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

- A weak trend (either increasing or decreasing) will be indicated by a confidence level less than 95 percent but greater than or equal to 90 percent.
- For a constituent exhibiting no trend at the 95% confidence level, concentrations are deemed stable if the coefficient of variation (COV) is equal to or less than one.

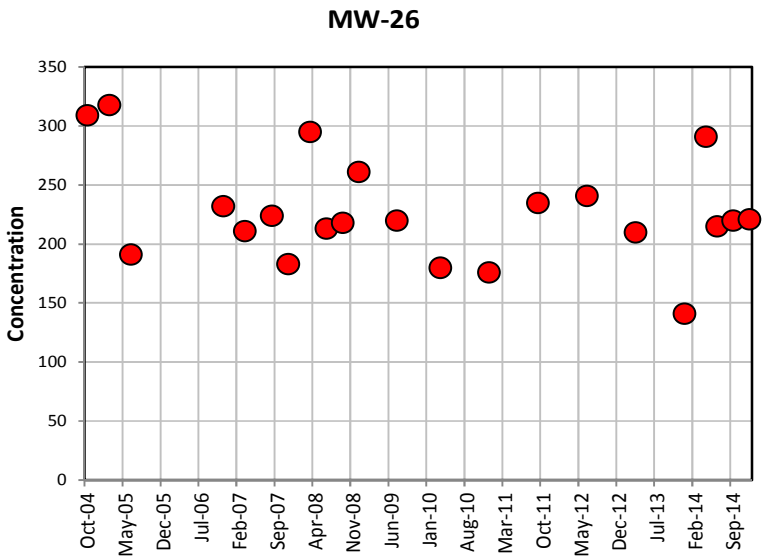
(-) = negative trend

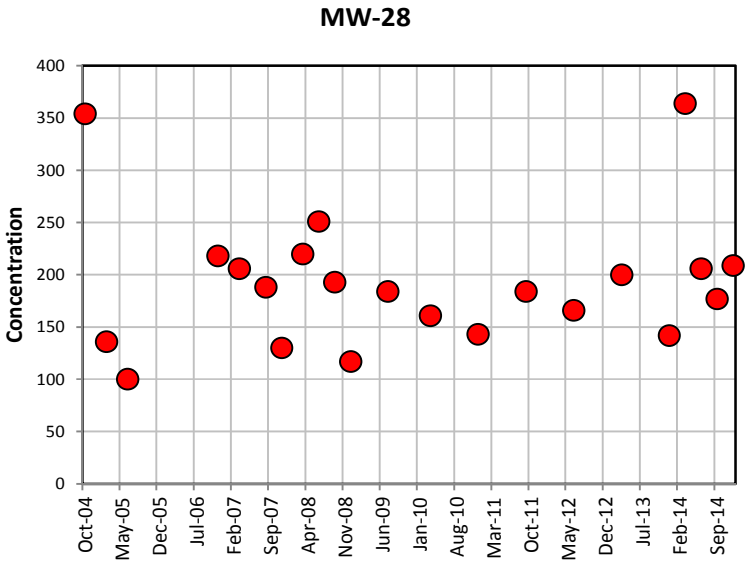




Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

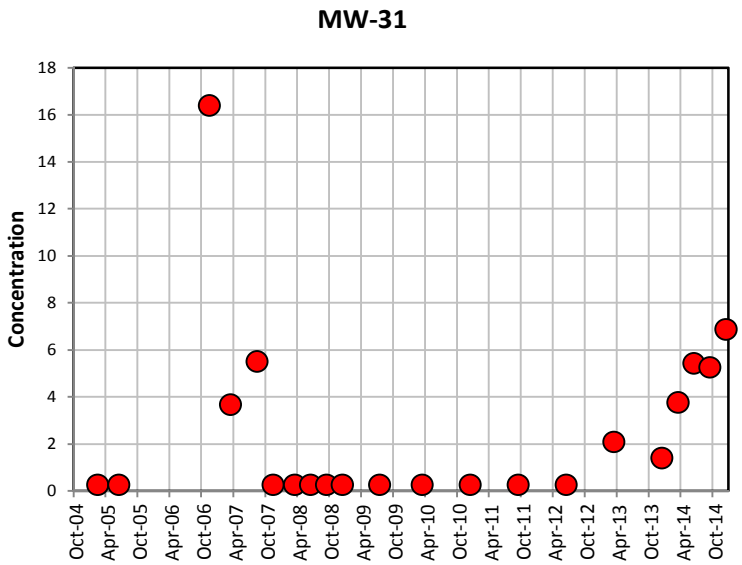
Figure B-1
Temporal Concentrations of 1,4-Dioxane in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia





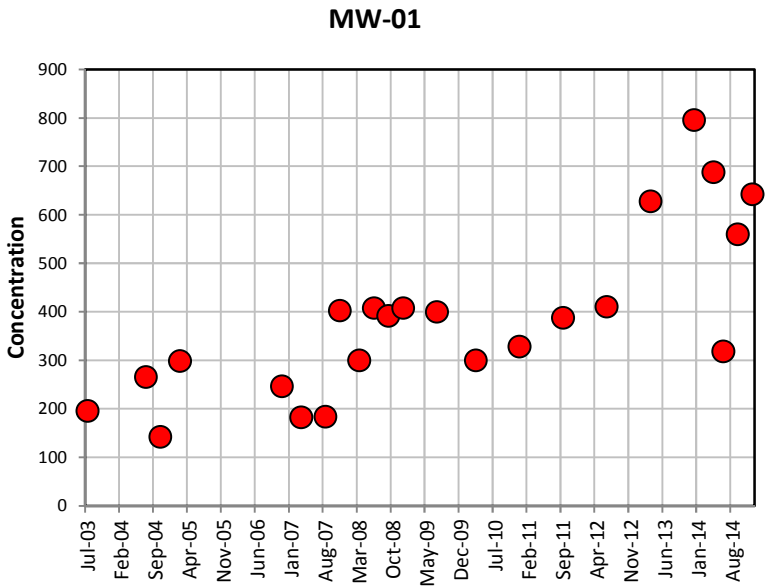
Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

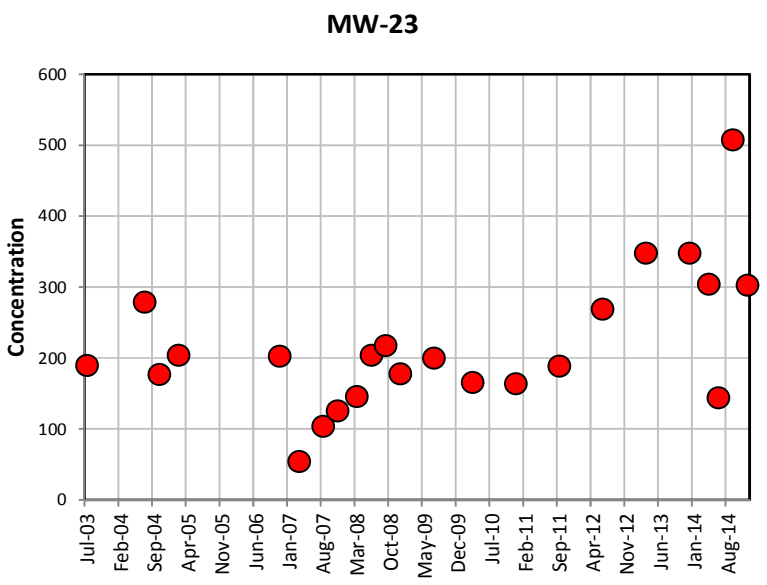
Figure B-1
Temporal Concentrations of 1,4-Dioxane in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia



Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

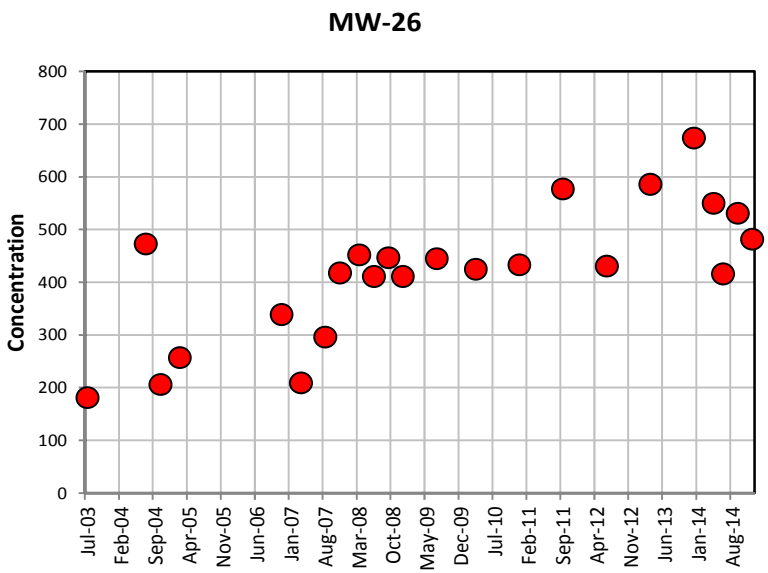
Figure B-1
Temporal Concentrations of 1,4-Dioxane in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

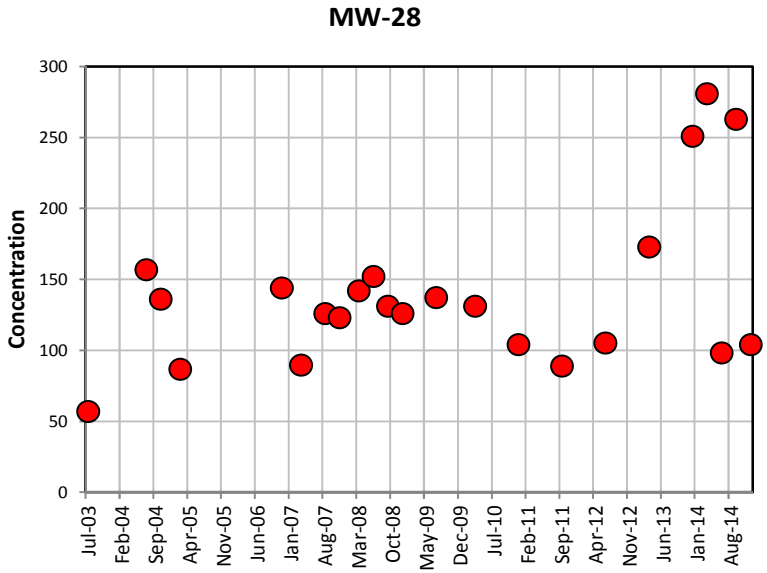




Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

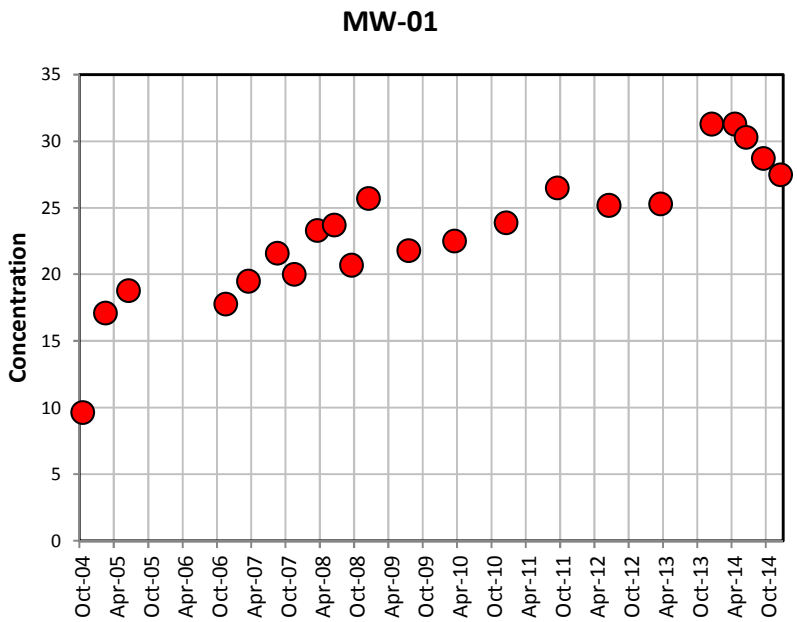
Figure B-2
Temporal Concentrations of Bis (2-chloroisopropyl)ether in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

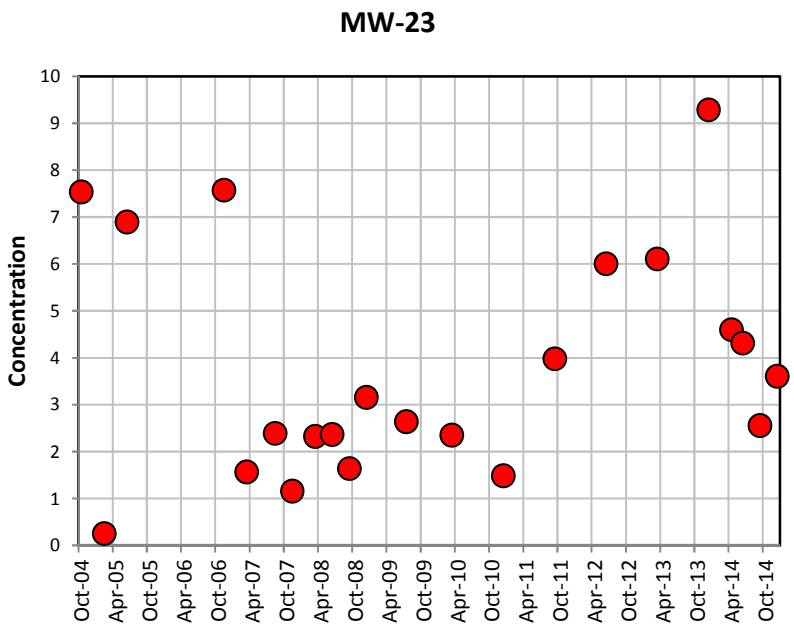




Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

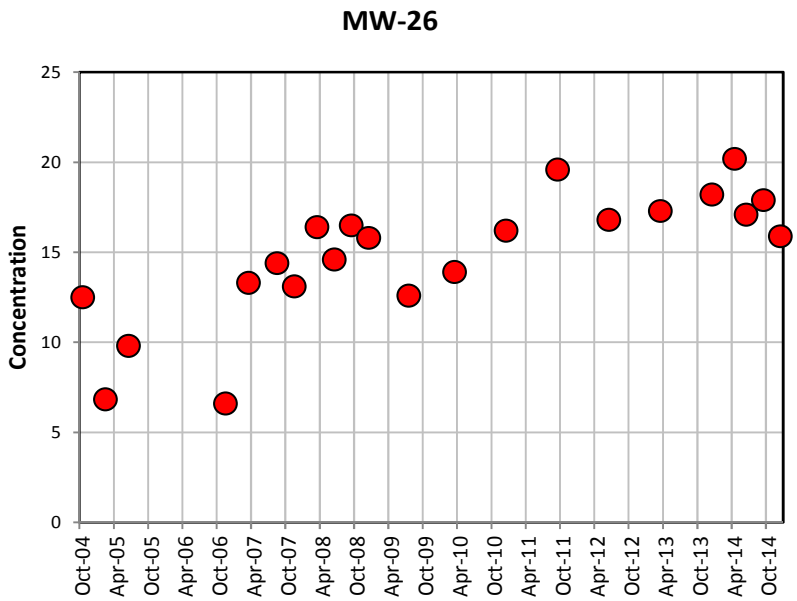
Figure B-2
Temporal Concentrations of Bis (2-chloroisopropyl)ether in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

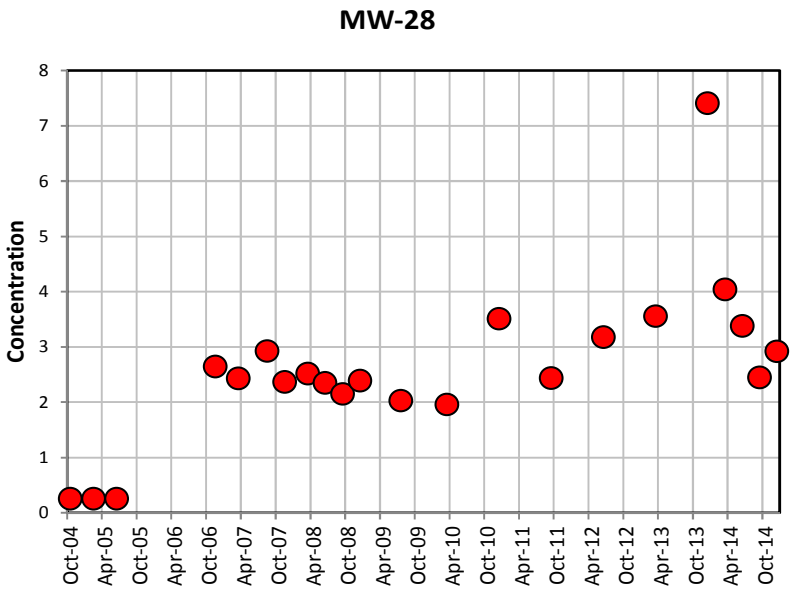




Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

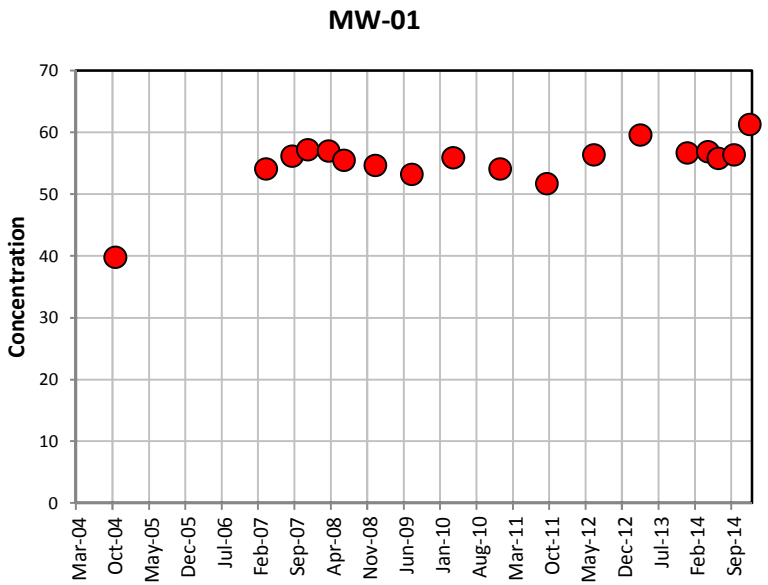
Figure B-3
Temporal Concentrations of Benzene in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

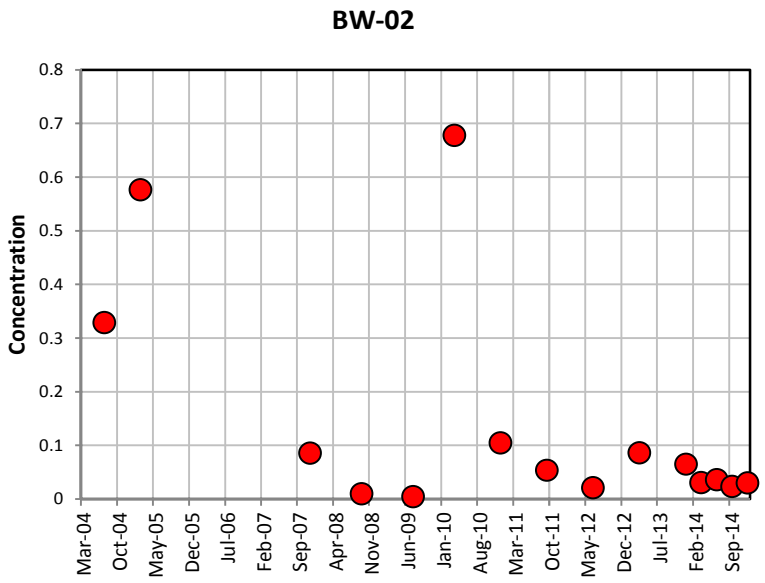




Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

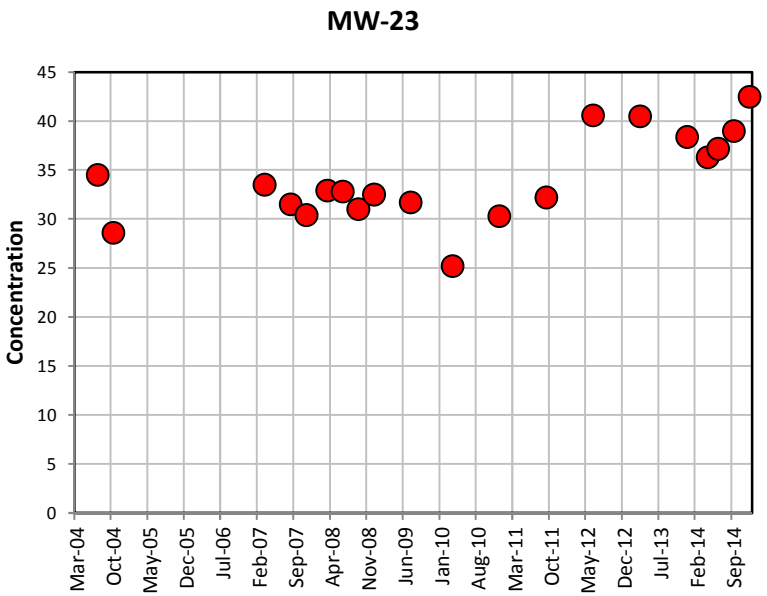
Figure B-3
Temporal Concentrations of Benzene in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

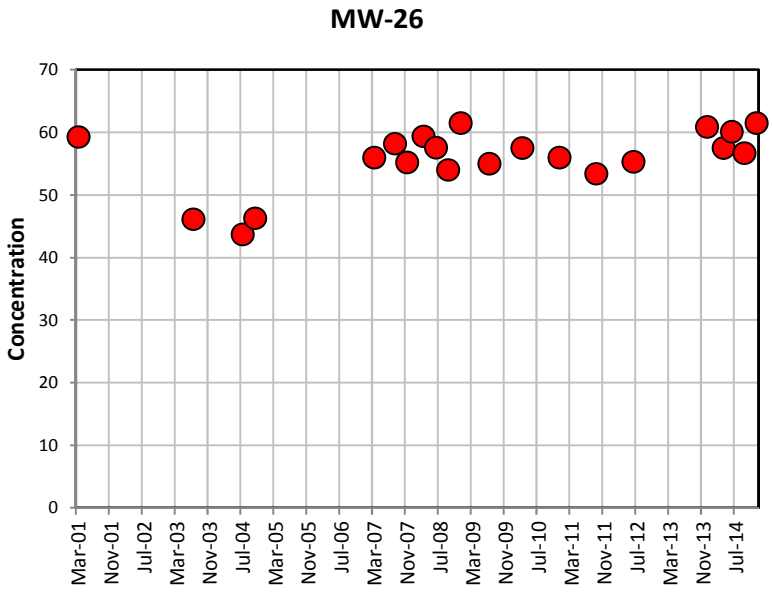




Note:
All concentrations in micrograms per liter (mg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

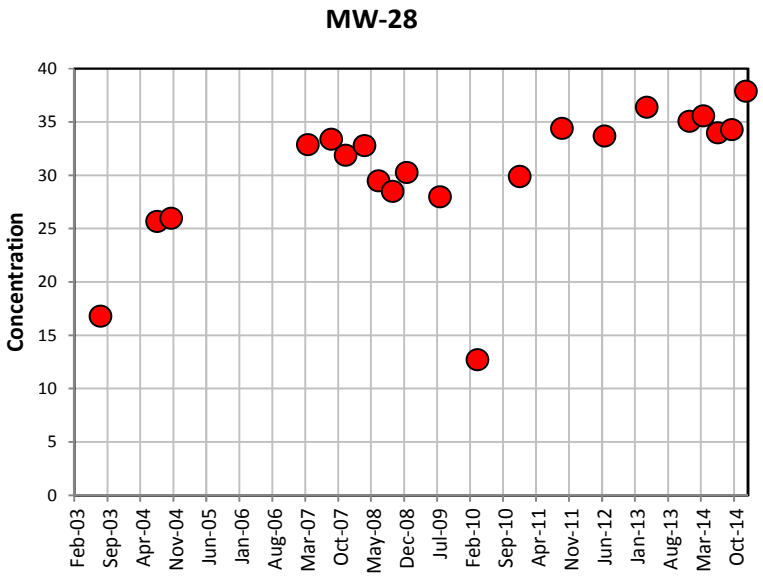
Figure B-4
Temporal Concentrations of Barium in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

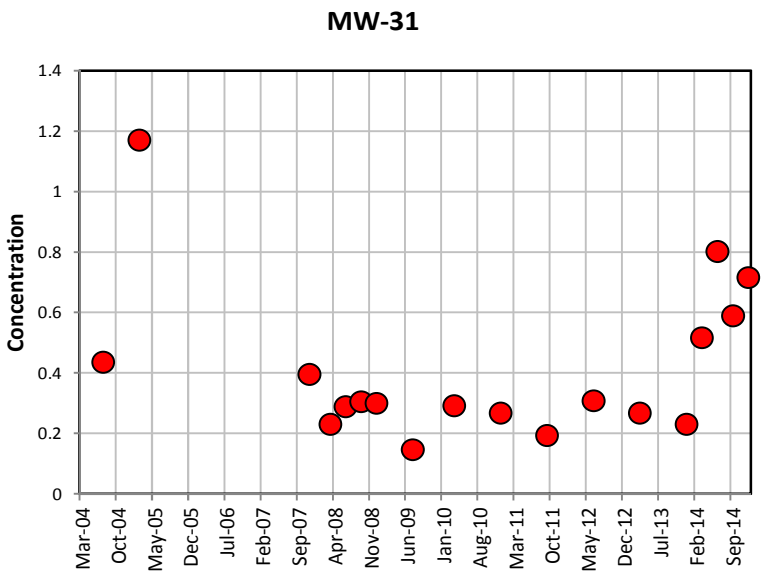




Note:
All concentrations in micrograms per liter (mg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

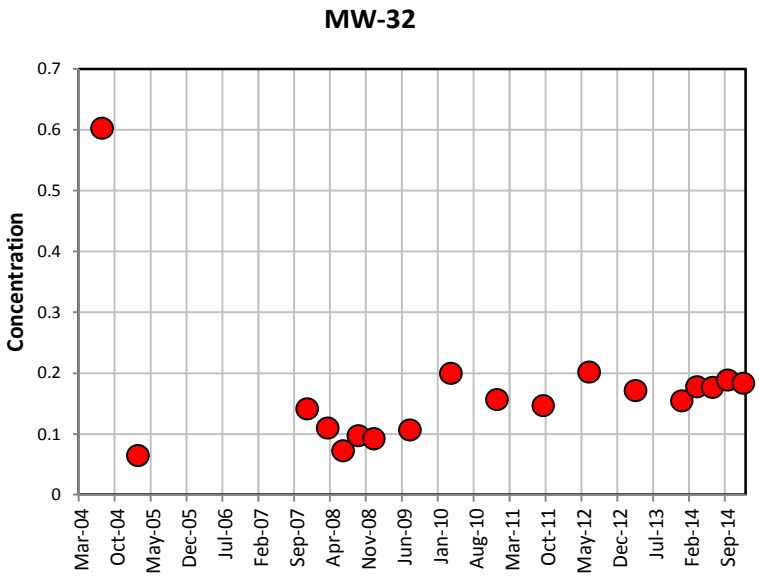
Figure B-4
Temporal Concentrations of Barium in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia





Note:
All concentrations in micrograms per liter (mg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

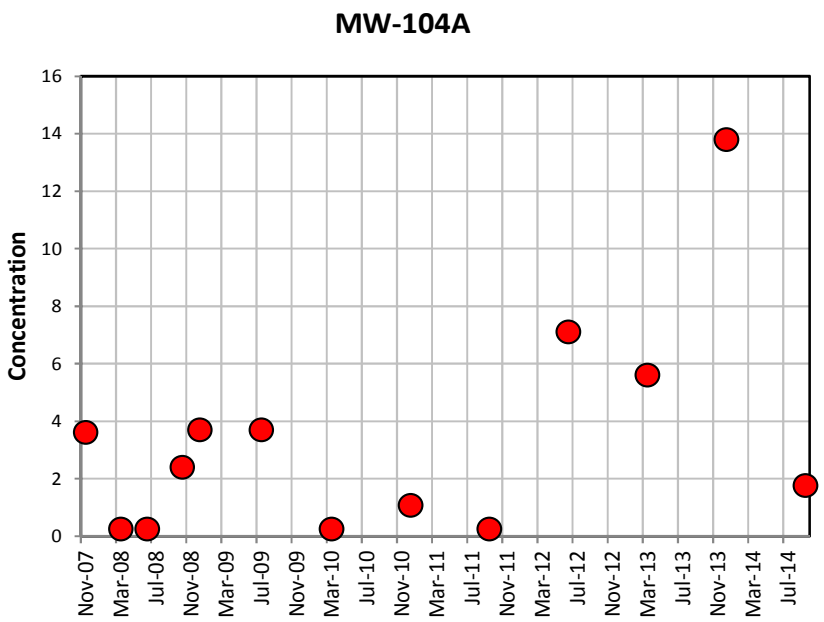
Figure B-4
Temporal Concentrations of Barium in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia

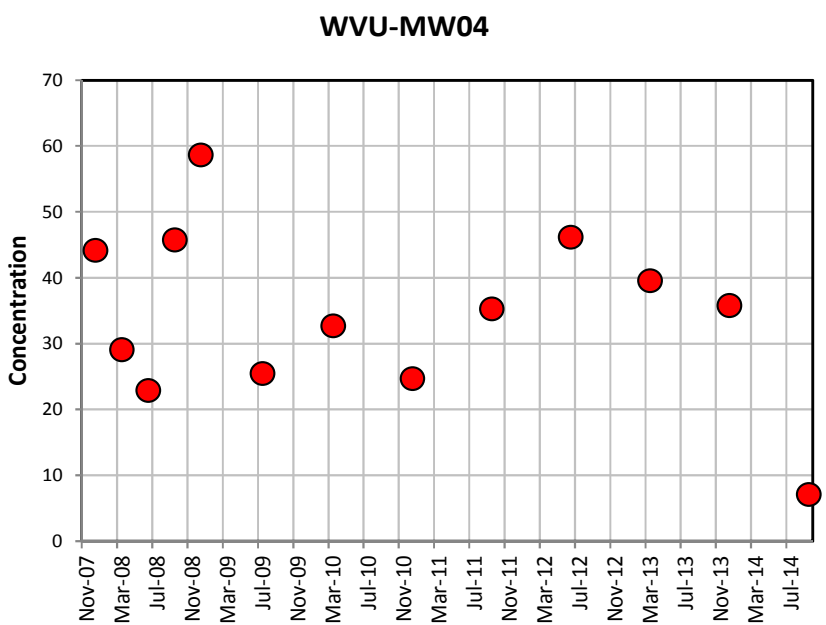


Note:
All concentrations in micrograms per liter (mg/L)

Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

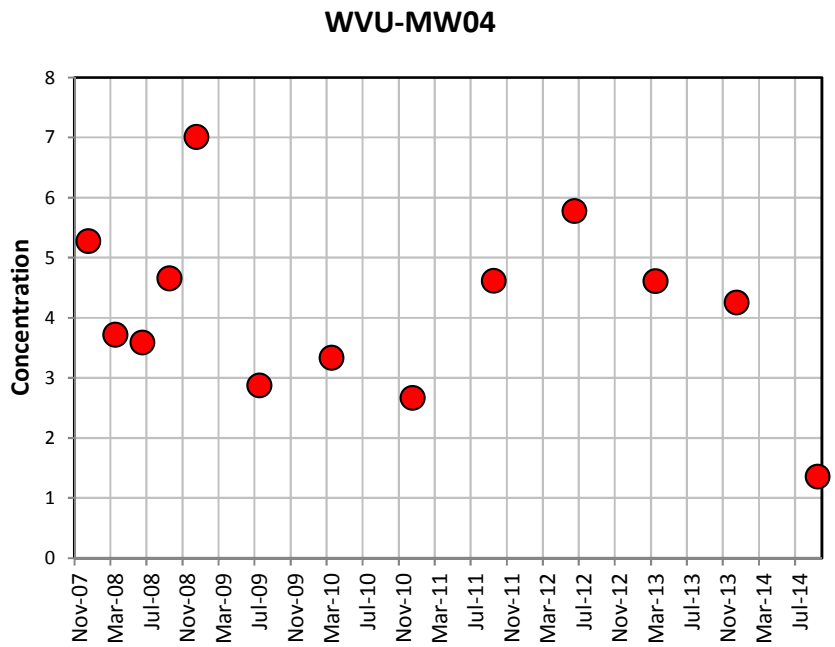
Figure B-4
Temporal Concentrations of Barium in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia





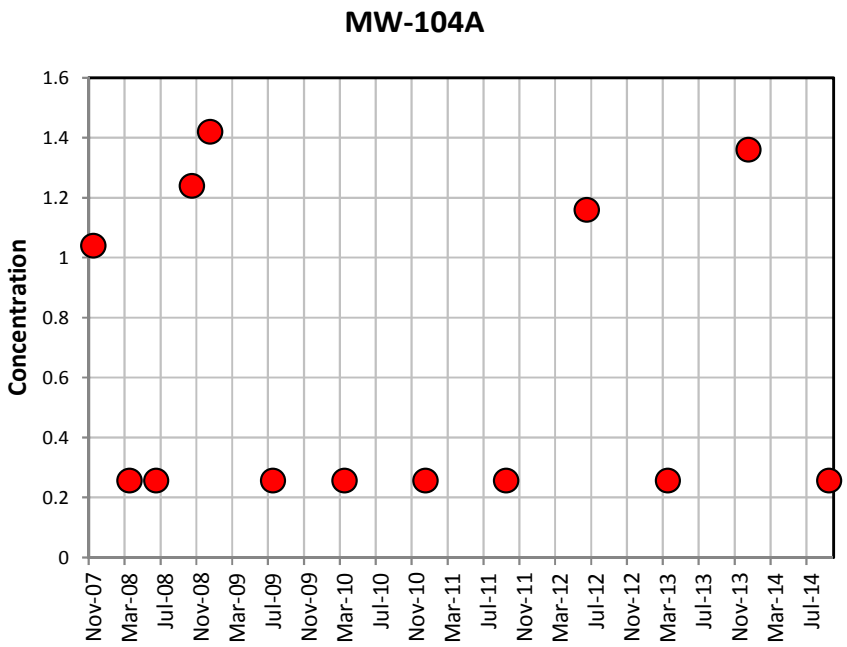
Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

Figure B-5
Temporal Concentrations of Tetrachloroethylene in Select Monitoring Wells
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia



Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

Figure B-6
Temporal Concentrations of Trichloroethylene in Select Monitoring Well
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia



Note:
All concentrations in micrograms per liter (µg/L)
Nondetects were assigned a common value that is smaller than the smallest measured value in the data set

Figure B-7
Temporal Concentrations of Chloroform in Select Monitoring Well
2014 Groundwater Monitoring Report
UCC Technology Park, South Charleston, West Virginia